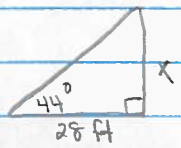
Day 1

Lesson 7.1.1 p. 316: 5, 6, 10 & Lesson 7.1.2 p. 320-321: 15-21

5 a.

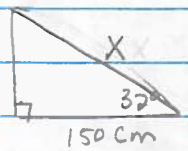


$\tan 44 = \frac{x}{28}$

$x = 28 \tan 44$

$x = 27.04$ ft

b.

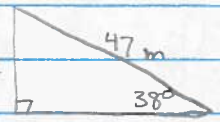


$\cos 32 = \frac{150}{x}$

$x = \frac{150}{\cos 32}$

$x = 176.88$ cm

c.

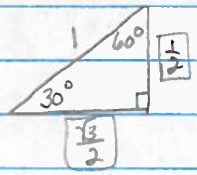


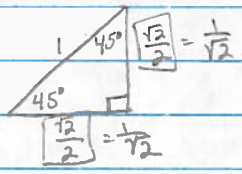
$\sin 38 = \frac{x}{47}$

$x = 47 \sin 38$

$x = 28.94$ m

6.





10. $y - 7 = 3^{(x+4)}$

x-int: $0 - 7 = 3^{x+4}$

$-7 = 3^{x+4}$

$\log_3(-7) = x + 4$

Error means

NO x-int

y-int: $y - 7 = 3^{(0+4)}$

$y - 7 = 3^4$

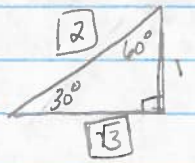
$y - 7 = 81$

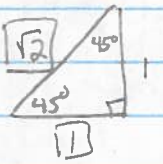
$y = 88$

(0, 88)

Day 1

Lesson 7.1.2 p. 320-321: 15-21

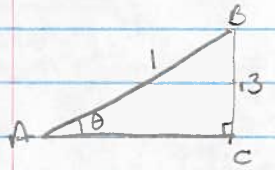
15. a. 



b. 

all sides = 2 units

all Angles = 60°

16 

$\sin A = \frac{.3}{1}$

$m\angle A = \sin^{-1}(.3)$

$= \boxed{17.46^\circ}$

17. $y = 2x^2 + x - 10$

y-int = $\boxed{(0, -10)}$

x-int: $\left(\frac{-5}{2}, 0\right)(2, 0)$

$2x^2 + x - 10 = 0$

5	$5x$	-10
$2x$	$2x^2$	$-4x$
	x	-2

$-20x^2$

$5x \quad -4x$

$1x$

$(2x+5)(x-2) = 0$

$x = \frac{-5}{2}, \; x = 2$

18. a. $\log(1) = \log_{10} 1 \qquad 10^x = 1 \qquad \boxed{x = 0}$

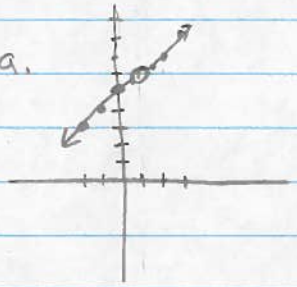
b. $\log(10^3) = \log_{10}(10^3) \qquad 10^x = 10^3 \quad$ So $\boxed{x = 3}$

c. $10^{\log(4)} = 10^{\log_{10}(4)} \qquad \log_{10} x = \log_{10} 4 \quad$ So $\boxed{x = 4}$

d. $10^{3\log 4} = 10^{\log 4^3} = 10^{\log_{10} 64} \qquad \boxed{x = 64}$

19. $f(x) = \frac{x^2+4x-5}{x-1}$

x	-2	-1	0	1	2	3
y	3	4	5	—	7	8

a. 

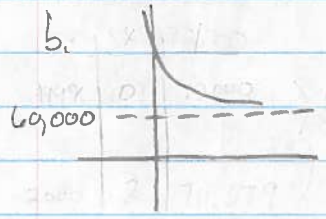
- It appears to be linear.
- we can't connect all the points b/c the function is undefined at $x=1$

b. It appears that if $f(x)$ was defined at $x=1$, the y-value would be 6... for every 1 horizontal unit away from (1, 6) the graph is 1 unit up or down from $y=6$.

$f(.9) = 5.9$, $f(1.1) = 6.1$

there is no asymptote

20. a. Exponential represents pop. growth or decline

b. 

0	72000
1	
2	70379

shift the graph down 60,000

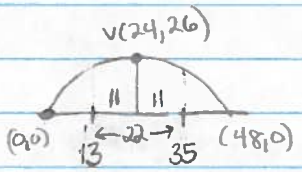
0	12000
1	
2	10379

$\frac{10379}{12000} = b^2$

$b^2 = .865$

$b = .93$

$y = 12000(.93)^x + 60000$

21. 

$y = a(x-h)^2 + k$

$y = a(x-24)^2 + 26$

$0 = a(0-24)^2 + 26$

$-26 = 576a$

$a = \frac{-13}{288}$

$y = \frac{-13}{288}(x-24)^2 + 26$

let $x = 13$

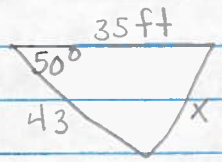
$y = \frac{-13}{288}(13-24)^2 + 26$

$y = 20.53$ ft. high

No, the tunnel is only 20.53 ft high at 11 ft. from the center

Day 2

Lesson 7.1.2 p. 322-323: 22-32

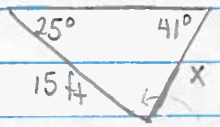
22 a. 

use law of cos (SAS)

$x^2 = 35^2 + 43^2 - 2(35)(43)\cos 50$

$\sqrt{x^2} = \sqrt{1139.2}$

$x = 33.75$ ft

b. 

use law of sines (AAS)

$\frac{\sin 25}{x} = \frac{\sin 41}{15}$

$x = \frac{15 \sin 25}{\sin 41} = 9.66$ ft

23. $x + y + z = 40$

$y = x - 5$

$x = 2z$

$x + y + z = 40$

$y = 2z - 5$

$2z + 2z - 5 + z = 40$

$5z - 5 = 40$

$5z = 45$

$z = 9$

$y = 18 - 5$

$y = 13$

$x = 18$

(18, 13, 9)

24. If $h(\theta) = \sin\theta$, then Domain: $-\infty < x < \infty$ b/c the graph will continue horizontally forever.

25. chg. 65 ft into .65, so $\sin\theta = .65$

$\theta = \sin^{-1}(.65)$

$\theta = 40.54°$ → 1st Quad.

$\theta = 139.46°$ → 2nd Quad.

26. $y = 3x^2 - 24x + 55$

$y = 3(x^2 - 8x + 16) + 55 - 48$

$y = 3(x-4)^2 + 7$

$V(4,7)$

she didn't subtract 3·16 on the right side.

27. $\left(\frac{13^{12}}{14^{23}}\right)\left(\frac{27^{3}}{18^{14}}\right)\left(\frac{2^{2}}{27^{4}}\right)\left(\frac{14^{23}}{13}\right)\left(\frac{27}{2^{2}}\right) = \frac{2}{14} = \boxed{\frac{1}{7}}$

14

28. $1+x - y \geq 3x - 2y - 4 \Rightarrow y \geq 2x - 5$ line, solid

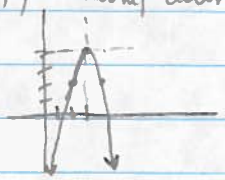
$y < 2x^2 + 1$ $\quad y < 2x^2 + 1$ Parabola, dotted, V(0,1), up

check (0,0): $0 \geq -5$ T

check (0,0): $0 < 1$ T

29. a. $y = -2(x-3)^2 + 4$

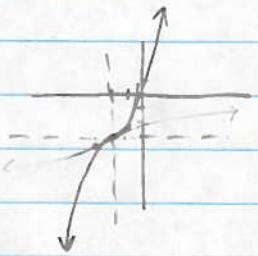
V(3,4), Parabola, down



b. $y = \frac{1}{2}(x+2)^3 - 3$

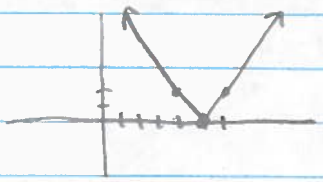
C(-2,-3)

cubic



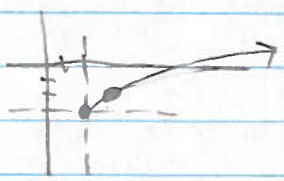
c. $y = 2|x-5|$

V(5,0), V-shape, up



d. $y = \sqrt{x-2} - 3$

Sq. root, (2,-3)



30. $y+3 = 8x^2 - 10x$

$y = 8x^2 - 10x - 3$

y-int: $(0, -3)$

x-int: $8x^2 - 10x - 3 = 0$

-3	$-12x$	-3
$2x$	$8x^2$	$2x$

$4x \quad 1$

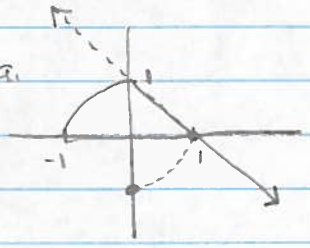
$-24x^2$, $-12x$, $2x$, $-10x$

$(2x-3)(4x+1) = 0$

$x = \frac{3}{2}, \quad x = \frac{-1}{4}$

x-int: $(\frac{3}{2}, 0)$ and $(\frac{-1}{4}, 0)$

31. a.



Inverse is dotted

b. The inverse is not a function b/c it fails the vertical line test.

32. $r = b + 5$

$r = 2g$

$r + b + g = 40$

$b + 5 = 2g$

$b = 2g - 5$

$2g + 2g - 5 + g = 40$

$5g - 5 = 40$

$5g = 45$

$g = 9$ green marbles

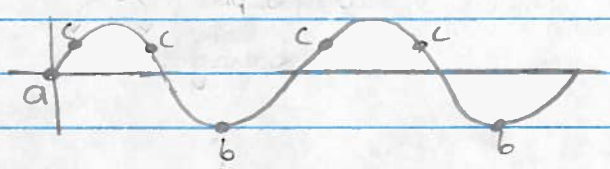
$b = 18 - 5$

$b = 13$ blue marbles

$r = 18$ red marbles

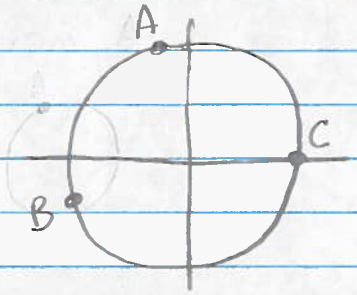
Lesson 7.1.3 p. 325-326 : 36-44

36.

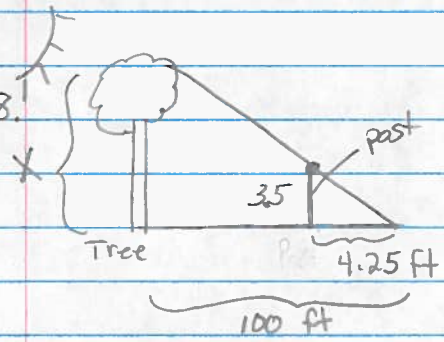


a = gets on initially
b = Bottom of water
c = $\frac{1}{2}$ way between highest point & ground

37.



38.



$\frac{4.25}{3.5} = \frac{100}{X}$

cross multiply!

$X = \frac{3.5(100)}{4.25}$

$X = 82.35$ ft

39. $\log 2 = .3010$, $\log 3 = .4771$, $\log 5 = .6990$

a. $\log 6 = \log 2 + \log 3 = .3010 + .4771 = .7781$

b. $\log 15 = \log 3 + \log 5 = .4771 + .6990 = 1.1761$

c. $\log 9 = \log 3^2 = 2 \log 3 = 2(.4771) = .9542$

d. $\log 50 = \log 5^2 + \log 2 = 2 \log 5 + \log 2 = 2(.6990) + .3010 = 1.699$

40. $y = 3x^2 + 6x + 1$

y-int: (0, 1)

x-int: $3x^2 + 6x + 1 = 0$

	1
$3x^2$	

$3x^2$ × $6x$

doesn't factor

QF: $x = \frac{-6 \pm \sqrt{36 - 4(3)(1)}}{2(3)}$

$x = -.18$ and $x = -1.82$

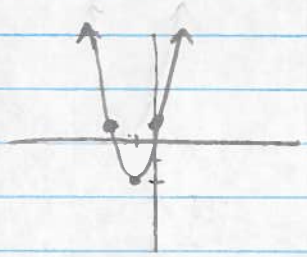
x-int: (-.18, 0) and (-1.82, 0)

41. $y = 3x^2 + 6x + 1$ (complete the square)

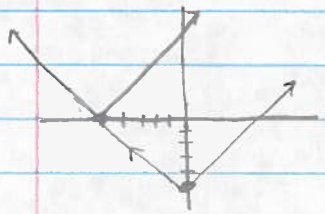
$y = 3(x^2 + 2x + 1) + 1 - 3$

$y = 3(x+1)^2 - 2$

V(-1, -2)



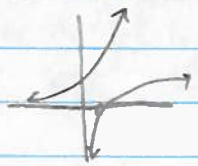
42. $|x+5| = |x| - 5$



These graphs are only equal where they overlap when $x \leq -5$

43. $\log_2 x = 2^x$ converts to $2^{2x} = x$, but this doesn't help.

So the graph looks like



so the will never intersect

∴ NO solution

44. $W = C - 5$

$C = 2P$

$W + C + P = 40$

$w = 2P - 5$

$2P - 5 + 2p + p = 40$

$5p - 5 = 46$

$5p = 45$

$p = 9$ Pennsylvania

$W = 18 - 5$

$w = 13$ Washington

$C = 18$ California

Lesson 7.1.4 (day 1) p. 239-240: 53-60

53. $\sin\theta = \frac{1}{4}$

$\left(\frac{\sqrt{15}}{4}, \frac{1}{4}\right)$

$\sin^2\theta + \cos^2\theta = 1$

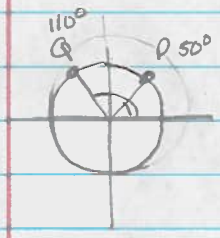
$\left(\frac{1}{4}\right)^2 + \cos^2\theta = 1$

$\cos^2\theta = 1 - \frac{1}{16}$

$\sqrt{\cos^2\theta} = \sqrt{\frac{15}{16}}$

$\cos\theta = \frac{\sqrt{15}}{4}$

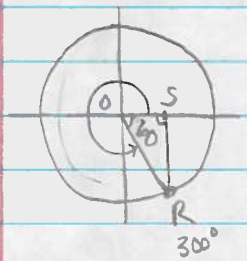
54.



P: $(\cos 50, \sin 50) = (.64, .77)$

Q: $(\cos 110, \sin 110) = (-.34, .94)$

55.



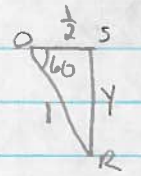
a. $\overline{OR}$ has rotated $360° - 60° = 300°$

b. Exact means no decimals!

$\overline{OS} = \cos 300 = .5 = \frac{1}{2}$

$\overline{SR} = \sin 300 = -.87$

c. $R\left(\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$



$\sin^2\theta + \cos^2\theta = 1$

$\sin^2\theta + \left(\frac{1}{2}\right)^2 = 1$

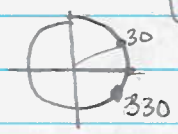
$\sqrt{\sin^2\theta} = \pm\sqrt{\frac{3}{4}}$

$\sin\theta = -\frac{\sqrt{3}}{2}$

So, $\overline{SR} = -\frac{\sqrt{3}}{2}$

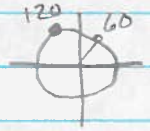
56. a. $330°$

$\alpha = 30°$



b. $120°$

$\alpha = 60°$



c. $113°$

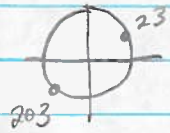
$\alpha = 90 - 23$

$\alpha = 67°$

d. $203°$

$\alpha = 203 - 180$

$\alpha = 23°$



57. $\left(\frac{1}{8}\right)^{2x-3} = \left(\frac{1}{2}\right)^{x+2}$ rewrite using the same base #

$\left(2^{-3}\right)^{2x-3} = \left(2^{-1}\right)^{x+2}$

$2^{-6x+9} = 2^{-x-2} \Rightarrow -6x+9 = -x-2$

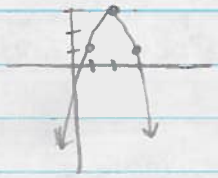
$11 = 5x$

$x = \frac{11}{5}$

58. a. $y = -2(x-2)^2 + 3$

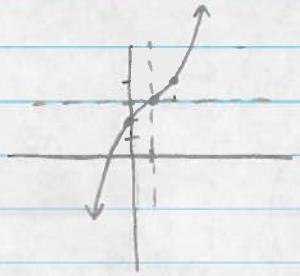
Parabola, down,

Stretch = 2, V(2, 3)



b. $y = (x-1)^3 + 3$

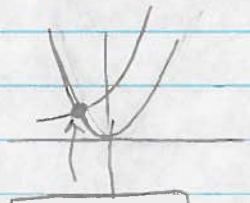
cubic, c(1, 3)



59. $3^x + 5 = x^2 - 5$

$3^x + 10 = x^2$

Then graph



$x = -3.17$

60. a. Rip-off Rental: $y = 25d + .50m$

Teacher: $y = .015(2)^m$ or $y = .03(2)^m$

0	.015
1	.03
2	.06
3	.12

÷2 ↓ ×2

b. 10 miles:

R: $y = 25(2) + .5(10) = \$55$

T: $y = .015(2)^{10} = \$15.36$

Teacher

b. 20 miles

R: $y = 25(2) + .5(20) = \$60$

T: $y = .015(2)^{20} = \$15,728.64$

Rip-off

100 miles

R: $y = 25(2) + .5(100) = \$100$

T: $y = .015(2)^{100} = \$1.9 \times 10^{28}$

Rip-off

Lesson 7.1.4 (day 2) p. 241-243: 62-70 (omit 69)

62.

$\cos\theta = .53$

$\theta = \cos^{-1}(.53)$

$\theta = 58^\circ$

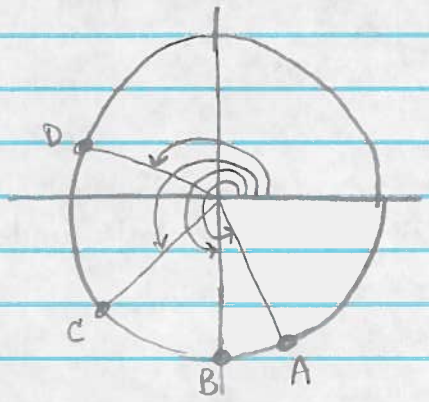
$180 - 58 = 122^\circ$

$180 + 58 = 238^\circ$

$360 - 58 = 302^\circ$

$58^\circ, 122^\circ, 238^\circ$ or 302°

63.



a. An angle in 4th Quadrant

b. Bottom of Circle (270° or -90°)

c. An angle in 3rd Quadrant

d. An angle in 2nd Quadrant a little less than 180°

e. NO if $\sin\theta = .9$, then

$\sin^2\theta + \cos^2\theta = 1$

$(.9)^2 + \cos^2\theta = 1$

$\sqrt{\cos^2\theta} = \sqrt{.19}$

$\cos\theta = \pm .44$

64.

a. $R(\cos 70, \sin 70) = (.34, .94)$ = approx. values

b. $(\cos 70, \sin 70)$ = exact values

c. $\sin^2\theta + \cos^2\theta = 1$

$\sin^2(70) + \cos^2(70) = 1$ ✓ It checks on the calculator

65. $y = \sin\theta$ will always go through the origin, which is graph 2.

66. $y = \cos x$ a. **yes**

$y = -1$

Substitution: $-1 = \cos x$

$x = \cos^{-1}(-1)$

$x = 180^\circ$

Elimination

$-y = -\cos x$

$y = -1$

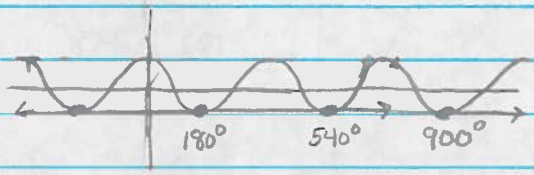
$0 = -\cos x - 1$

$-\cos x = -1$

$x = \cos^{-1}(-1)$

$x = 180^\circ$

Graphing (must go to zoom 7)



$x = 180^\circ$

b. **$\pm 180^\circ, \pm 540^\circ, \pm 900^\circ \ldots$** See the graph above to understand

c. **$x = 180^\circ \pm 360n$**

67. $y = x^2 + 4x - 17$

y-int: **$(0, -17)$**

x-int: $x^2 + 4x - 17 = 0$

	-17
x^2	

$17x^2$

$4x$

doesn't factor

QF: $x = \dfrac{-4 \pm \sqrt{16 - 4 \cdot 1 \cdot -17}}{2 \cdot 1}$

$x = 2.58, \quad x = -6.58$

$(2.58, 0)$ $(-6.58, 0)$

68. a. $\dfrac{3}{x+1} = \dfrac{4}{x}$

$3x = 4x + 4$

$-x = 4$

$x = -4$

b. $\left(\dfrac{3}{x+1}\right)^{x(x+1)} + \left(\dfrac{4}{x}\right)^{x(x+1)} = \left(2\right)^{x(x+1)}$

$3x + 4x + 4 = 2x^2 + 2x$

$7x + 4 = 2x^2 + 2x$

$2x^2 - 5x - 4 = 0$

	-4
$2x^2$	

$-8x$

$-5x$

doesn't factor

QF: $x = \dfrac{5 \pm \sqrt{25 - 4 \cdot 2 \cdot 4}}{2 \cdot 2}$

$x = 3.14, \quad x = -.64$

68. c $\left(\frac{3}{x+2}\right)^{x+2} + (5)^{x+2} = \left(\frac{3}{x+2}\right)^{x+2}$

$3 + 5x + 10 = 3$

$5x = -10$

$x = -2$

but $x = -2$ is extraneous

NO solution

d.
$x = -2$ is extraneous b/c it makes the eq'n undefined ($\div$ by 0)

70. $t(n) = 9n - 2$

Tess is correct b/c a sequence has no more than 1 output for each input, which makes it a function. In a sequence, the domain is integers > 0

Lesson 7.1.5 p. 335-336: 77-85

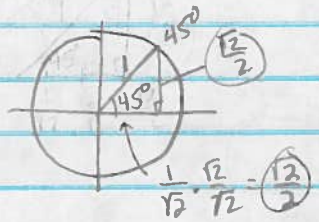
77. a. $\sin(60) = .87$ The answers are the same because
$\sin\left(\frac{\pi}{3}\right) = .87$ $60^\circ = \frac{\pi}{3}$ radians... The angles are equal.

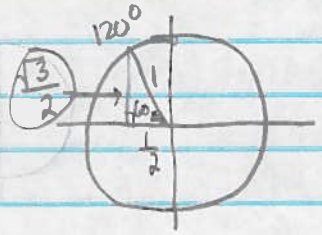
b. $\sin\left(\frac{\pi}{4}\right) = .71$ $\frac{\pi}{4} \cdot \frac{180^\circ}{\pi} = \boxed{45^\circ}$ Keep rotating 1 full circle to get an infinite # angles

$180 - 45 = \boxed{135^\circ}$

78. a. $\sin\left(\frac{\pi}{4}\right) = \boxed{.71} = \boxed{\frac{\sqrt{2}}{2}}$ b. $\sin\left(\frac{2\pi}{3}\right) = \boxed{.87} = \boxed{\frac{\sqrt{3}}{2}}$

$\frac{\pi}{4} \cdot \frac{180^\circ}{\pi} = 45^\circ$ $\frac{2\pi}{3} \cdot \frac{180^\circ}{\pi} = 120^\circ$





79. a. $x(2x-1)(x-3) = 0$

$\boxed{x = 0,\ x = \frac{1}{2},\ x = 3}$

b. $2x^3 + x^2 - 3x = 0$

$x(2x^2 + x - 3) = 0$

3	$3x$	-3
$2x$	$2x^2$	$-2x$

$x \quad -1$

$-6x^2$

$3x \quad -2x$

x

$x(2x+3)(x-1) = 0$

$\boxed{x = 0,\ x = -\frac{3}{2},\ x = 1}$

80. a. $5^x = 72$ b. $2^{3x} = 7$ c. $3^{(2x+4)} = 17$

$\log_5(72) = x$ $\log_2(7) = 3x$ $\log_3(17) = 2x + 4$

$\boxed{x = 2.66}$ $\boxed{x = .94}$ $\boxed{x = -.71}$

81. $y = 2x^2 - 6x + 2$

$y = 2(x^2 - 3x + 2.25) + 2 - 4.5$

$y = 2(x-1.5)^2 - 2.5$

$V(1.5, -2.5)$

Greg didn't multiply $\frac{9}{4} \cdot 2$

82. a. $y = 3x^2 - 18x + 26$

$y = 3(x^2 - 6x + 9) + 26 - 27$

$y = 3(x-3)^2 - 1$

$V(3, -1)$

Symm: $x = 3$

b. $y = 3x^2 - 4x - 11$

$y = 3(x^2 - \frac{4}{3}x + \frac{4}{9}) - 11 - \frac{4}{3}$

$\frac{4}{3} \cdot \frac{1}{2} = (\frac{4}{6})^2 = \frac{16}{36} = \frac{4}{9}$

$y = 3(x - \frac{2}{3})^2 - \frac{37}{3}$

$V = (\frac{2}{3}, -\frac{37}{3})$

Symm: $x = \frac{2}{3}$

83. a. $171 = 3(5^x)$

$57 = 5^x$

$\log_5(57) = x$

$x = 2.51$

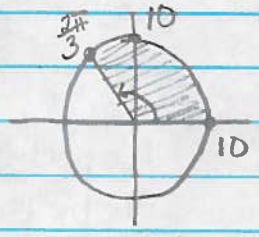
b. $\frac{171y}{5} = \frac{3(x^5)}{5}$

$\sqrt[5]{57y} = x$

$x = \sqrt[5]{57y}$

84. $x^2 + y^2 = 100$

Circle, $c(0,0)$, radius $= 10$



a. Not a function

b. D: $-10 \le x \le 10$

R: $-10 \le y \le 10$

c. $\frac{2\pi}{3} \cdot \frac{180^\circ}{\pi} = 120^\circ$

$A = \pi r^2 = \pi(10)^2 = 100\pi$, $\frac{100\pi}{3}$ = Area of shaded part

So, remaining area is $\frac{100\pi}{1} - \frac{100\pi}{3} = \frac{200\pi}{3} = 209.44$ sq. units

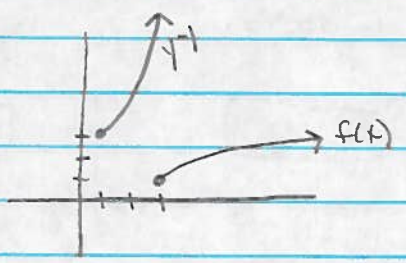
85. $f(x) = 2\sqrt{\frac{(x-3)}{4}} + 1$

x: -3, $+4$, $\sqrt{}$, $*2$, $+1$

$y^{-1} = 4\left[\frac{(x-1)}{2}\right]^2 + 3$

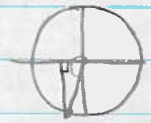
$y^{-1} = 4\left[\frac{(x-1)^2}{4}\right] + 3$

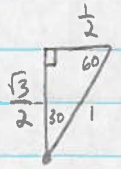
$y^{-1} = (x-1)^2 + 3$ $V(1,3)$



Lesson 7.1.6 p. 339-340: 90-98

90. a. $\sin(4) = \boxed{-.76}$ b. $\sin\left(\frac{4\pi}{3}\right)$



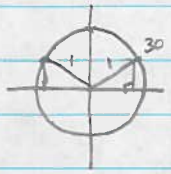


$\boxed{-\frac{\sqrt{3}}{2}}$

91. $\sin\theta = .5$

$\sin^{-1}(.5) = \theta$

$\theta = 30°$



$\theta = 30°$ and $\theta = 150°$

$30° \cdot \frac{\pi}{180°} = \boxed{\frac{\pi}{6}}$ $150° \cdot \frac{\pi}{180°} = \boxed{\frac{5\pi}{6}}$

92.

Degrees	0	30°	45°	60°	90°	120°	150°	180°
Radians	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π

Top $\frac{1}{2}$ of Circle

Degrees	210°	225°	240°	270°	300°	315°	330°	360°
Radians	$\frac{7\pi}{6}$	$\frac{3\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{7\pi}{4}$	$\frac{11\pi}{6}$	2π

Bottom $\frac{1}{2}$ of Circle

93. a. 6 radians $\cdot \frac{180°}{\pi} \approx \boxed{343.8°}$

b. $\sin 6 \approx \boxed{-.4}$

94. a. $\log(10) = \boxed{1}$ c. $\log(0) = \boxed{\text{undefined}}$

b. $\log(\sqrt{10}) = \boxed{\frac{1}{2}}$ d. $10^{\frac{2}{3}\log(27)} = \boxed{9}$

95. $y = a(b)^x$

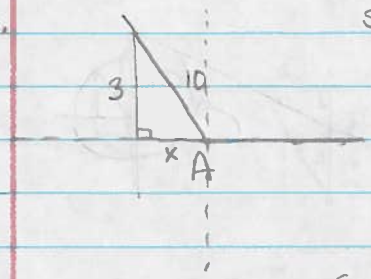
$\frac{2a}{a} = \frac{a(b)^{15}}{a}$

$\sqrt[15]{2} = \sqrt[15]{b^{15}}$

$b = \sqrt[15]{2} = 1.04729\ldots$

$\boxed{\text{rate} = 4.73\%}$

96.



$\sin A = \frac{3}{4} = \frac{opp}{hyp}$

$x^2 + 3^2 = 10^2$

$x^2 = 100 - 9$

$x^2 = 91$

$x = -\sqrt{91}$

So, $\tan = \frac{opp}{adj} = \frac{3}{-\sqrt{91}} \cdot \frac{\sqrt{91}}{\sqrt{91}} = \boxed{\frac{-3\sqrt{91}}{91} \text{ or } -.31}$

97. a. $y = \sqrt[3]{4x-1}$

$x = 4^y$

$\log_4 x = y$

$y = \log_4 x$

$\boxed{y^{-1} = \frac{x^3+1}{4}}$

$y = \sqrt[3]{4x-1}$

$x = \sqrt[3]{4y-1}$

$x^3 = 4y - 1$

$x^3 + 1 = 4y$

$\boxed{y^{-1} = \frac{x^3+1}{4}}$

b. $y = \log_7 x$

$7^y = x$

$\log_7 x = y$

$\boxed{y^{-1} = 7^x}$

$y = \log_7 x$

$x = \log_7 y$

$\boxed{7^x = y^{-1}}$

98. a. $2(x-1)^2 = 18$

$\sqrt{(x-1)^2} = \sqrt{9}$

$x - 1 = \pm 3$

$x = 1 \pm 3$

$\boxed{x = 4 \text{ or } x = -2}$

b. $2^x + 3 = 10$

$2^x = 7$

$\log_2 7 = x$

$\boxed{x = 2.81}$

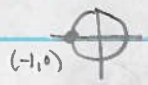
Lesson 7.1.7 p. 343-344: 104-112

104. $\frac{7\pi}{3} \cdot \frac{180^\circ}{\pi} = 420^\circ$ b.  $\alpha = 60^\circ$

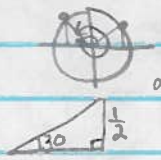
a. $60^\circ \pm 360^\circ n$ or $\frac{\pi}{3} \pm 2\pi n$

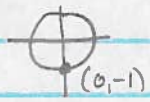
c. $\sin\left(\frac{7\pi}{3}\right) = \frac{\sqrt{3}}{2}$, $\cos\left(\frac{7\pi}{3}\right) = \frac{1}{2}$, $\tan\left(\frac{7\pi}{3}\right) = \frac{\sin}{\cos} = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \frac{\sqrt{3}}{2} \cdot \frac{2}{1} = \sqrt{3}$

105. a. $\sin(180^\circ) = 0$ b. $\sin(360^\circ) = 0$ c. $\sin(-90^\circ) = -1$



d. $\sin(510^\circ) = \frac{1}{2}$ e. $\cos(90^\circ) = 0$ f. $\tan(-90^\circ) = \frac{-1}{0}$ = undefined





106. D → R: multiply by $\frac{\pi}{180^\circ}$
R → D: multiply by $\frac{180^\circ}{\pi}$
> because we know that $180^\circ = \pi$ radians

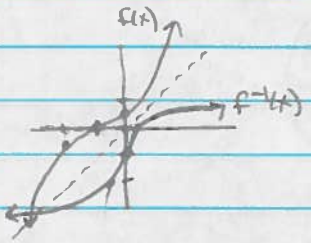
ex: $20^\circ \cdot \frac{\pi}{180} = \frac{\pi}{9}$ ex: $\frac{\pi}{15} \cdot \frac{180^\circ}{\pi} = 12^\circ$

107. a. $\frac{7\pi}{6} \cdot \frac{180^\circ}{\pi} = 210^\circ$ b. $\frac{5\pi}{3} \cdot \frac{180^\circ}{\pi} = 300^\circ$

c. $45^\circ \cdot \frac{\pi}{180^\circ} = \frac{\pi}{4}$ d. $100^\circ \cdot \frac{\pi}{180^\circ} = \frac{5\pi}{9}$

e. $810^\circ \cdot \frac{\pi}{180^\circ} = 4.5\pi$ or $\frac{9\pi}{2}$ f. $\frac{7\pi}{2} \cdot \frac{180^\circ}{\pi} = 630^\circ$

108. $f(x) = \frac{1}{2}(x+1)^3$ cubic, $c(-1,0)$, compression



x
$+1$
cube
$\times \frac{1}{2}$

$y^{-1} = \sqrt[3]{2x} - 1$

109. $f(x) = 2x^2 - 16x + 34$

$f(x) = 2(x^2 - 8x + 16) + 34 - 32$

$f(x) = 2(x-4)^2 + 2$

110.

a. $\sin^2\theta + \cos^2\theta = 1$

$\sin^2\theta + \left(\frac{-12}{13}\right)^2 = 1$

$\sin^2\theta = \frac{169}{169} - \frac{144}{169}$

$\sqrt{\sin^2\theta} = \sqrt{\frac{25}{169}}$

$\sin\theta = \pm\frac{5}{13}$

$\sin\theta = \frac{-5}{13}$

b. $\tan\theta = \frac{\sin\theta}{\cos\theta}$

$= \frac{\frac{5}{13}}{\frac{-12}{13}}$

$= \frac{-5}{13} \cdot \frac{13}{-12}$

$= \frac{5}{12}$

111. $\log_x 2 = a$, $\log_x 5 = b$, $\log_x 7 = c$

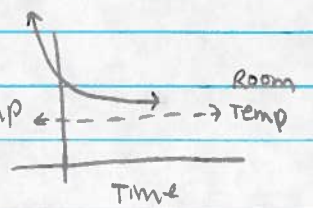
a. $\log_x 10 = \log_x 2 + \log_x 5 = a + b$

b. $\log_x 49 = \log_x 7^2 = 2 \cdot \log_x 7 = 2c$

c. $\log_x 50 = \log_x 2 + \log_x 5^2 = \log_x 2 + 2\log_x 5 = a + 2b$

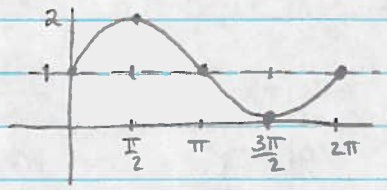
d. $\log_x 56 = \log_x 2^3 + \log_x 7 = 3 \cdot \log_x 2 + \log_x 7 = 3a + c$

112. a.



b. yes, the pizza will never get colder than room temp.

Lesson 7.2.1 p. 347-348: 116 - 124

116. a. 

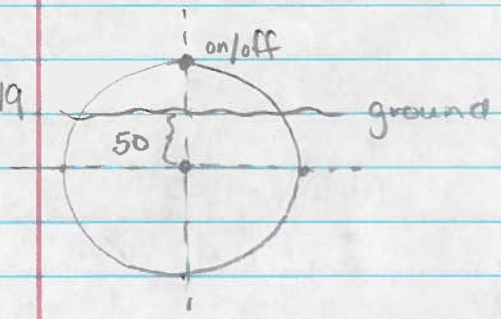
b. The K value must change
$y = \sin x + 1$

c. x-int: $(\frac{3\pi}{2}, 0) \pm 2\pi$
y-int: $(0, 1)$

d. yes b/c the graph has a domain of $-\infty < x < \infty$

117. a. The graph was shifted π units to the left.
b. $y = \sin(x - \pi)$ or $y = \sin(x + \pi)$

118. a. Numbers will go up/down, but not the same amounts, so this would not be cyclic
b. This may or may not be cyclic b/c the degree of hunger probably changes during the day.
c. This is probably the most cyclic since there is a high/low tide daily.

119. 

$y = 100\cos(x) - 50$

120. One graph could be the parent function of the other because they are the same graph just shifted 90° $(\frac{\pi}{2})$ to the right.
ex: $y = \sin(x + \frac{\pi}{2})$ is the same as $y = \cos(x)$

121. a. (1, 18) and (4, 3888)

0	3
1	18
2	
3	
4	3888

$\div 6$, $\times b$, $\times b$, $\times b$

$b^3 = \frac{3888}{18}$

$b^3 = 216$

$b = 6$

$y = 3(6)^x$

b. (−2, −8) and (3, −.25)

−2	−8
−1	−4
0	−2
1	
2	
3	−.25

$\times b$, $\times b$, $\times b$, $\times b$, $\times b$

$b^5 = \frac{-.25}{-8} = .03125$

$b = .5$

$y = -2(.5)^x$

122. a. $\left(\frac{3}{x}\right)\frac{x(x+1)}{} + \left(\frac{2}{x+1}\right)\frac{x(x+1)}{} = (5)^{x(x+1)}$

$3x+3+2x = 5x^2+5x$

$5x+3 = 5x^2+5x$

$5x^2 = 3$

$x^2 = \frac{3}{5}$

$x = \pm\sqrt{\frac{3}{5}}$

both ✓

b. $x^2+6x+9 = 2x^2+3x+5$

$0 = x^2-3x-4$

−4	−4x	−1
x	x^2	1x
	x	1

$-4x^2$, $-4x$, $1x$, $-3x$

$(x-4)(x+1)=0$

$x=4$, $x=-1$

both ✓

c. $8-\sqrt{9-2x} = x+3$

$-\sqrt{9-2x} = x-5$

$(\sqrt{9-2x})^2 = (-x+5)^2$

$9-2x = x^2-10x+25$

$0 = x^2-8x+16$

5	−5x	25
−x	x^2	−5x
	−x	5

−4	−4x	16
x	x^2	−4x
	x	−4

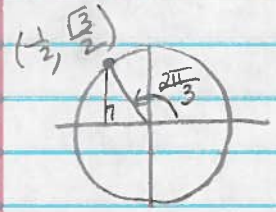
$16x^2$, $-4x$, $-4x$, $-8x$

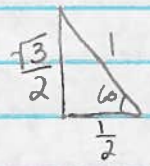
$(x-4)(x-4)=0$

$x=4$ $x=4$ ✓

$x=4$

123. a. $\tan\left(\frac{2\pi}{3}\right)$





$$\tan\left(\frac{2\pi}{3}\right) = \frac{\frac{\sqrt{3}}{2}}{-\frac{1}{2}}$$

$$= \frac{\sqrt{3}}{2} \cdot \frac{-2}{1}$$

$$= \boxed{-\sqrt{3}}$$

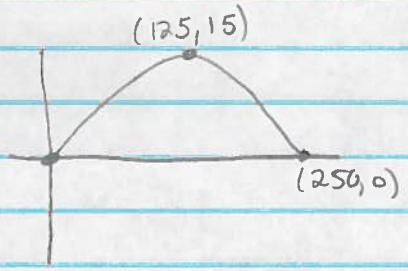
b. $\tan\left(\frac{7\pi}{6}\right)$

$$\tan\left(\frac{7\pi}{6}\right) = \frac{-\frac{1}{2}}{-\frac{\sqrt{3}}{2}}$$

$$= \frac{-1}{2} \cdot \frac{2}{-\sqrt{3}}$$

$$= \frac{1}{\sqrt{3}} = \boxed{\frac{\sqrt{3}}{3}}$$

124.



$$y = a(x-h)^2 + k$$

$$y = a(x-125)^2 + 15$$

$$0 = a(0-125)^2 + 15$$

$$-15 = 15625a$$

$$a = \frac{-15}{15625} = -\frac{3}{3125}$$

$$\boxed{y = \frac{-3}{3125}(x-125)^2 + 15}$$

Lesson 7.2.2 p. 351 - 353: 129-137 (omit 134a, 137b)

129. a. shift up 2, right $\frac{\pi}{4}$

$y = \sin(x - \frac{\pi}{4}) + 2$

b. Amp = 1.5, shift up $\frac{1}{2}$, left $\frac{\pi}{2}$

$y = 1.5 \sin(x + \frac{\pi}{2}) + \frac{1}{2}$

c. shift left $\frac{5\pi}{6}$, up 2

$y = \sin(x + \frac{5\pi}{6}) + 2$

or

$y = -\sin(x - \frac{\pi}{6}) + 2$

d. shift left $\frac{2\pi}{3}$, down 1, Amp = 3, Reflect

$y = -3\sin(x + \frac{\pi}{3}) - 1$

or

$y = 3\sin(x - \frac{2\pi}{3}) - 1$

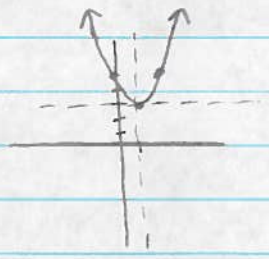
130. $y = \cos(\theta + 360°)$ shifts the graph left 360° which will line the 2 graphs up perfectly

131. $y = 2x^2 - 4x + 5$

$y = 2(x^2 - 2x + 1) + 5 - 2$

$y = 2(x-1)^2 + 3$

$V(1, 3)$

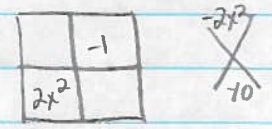


132. a. $y = 2x^3 - 10x^2 - x$

y-int: (0, 0)

x-int: $2x^3 - 10x^2 - x = 0$

$x(2x^2 - 10x - 1) = 0$



doesn't factor

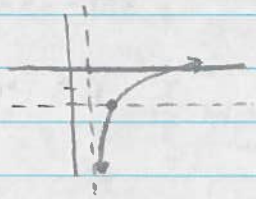
$x = \frac{10 \pm \sqrt{100 - 4 \cdot 2 \cdot -1}}{2(2)}$

$x = 0,\ x = 5.10,\ x = -.10$

(0, 0) (5.1, 0) (-.1, 0)

132 b. $y+2 = \log_3(x-1)$

$y = \log_3(x-1) - 2$



y-int: None

x-int: $\log_3(x-1) - 2 = 0$

$\log_3(x-1) = 2$

$3^2 = x-1$

$9 = x-1$

$x = 10$ (10, 0)

133. $100\% + 4\% = 104\% = 1.04$

$y = a(b)^x$

$19 = 9.50(1.04)^x$

$2 = 1.04^x$

$\log_{1.04}(2) = x$

$x = 17.7$ yrs

134 b. $y = -3x^2 - 6x + 12$

$y = -3(x^2 + 2x + 1) + 12 + 3$

$y = -3(x+1)^2 + 15$

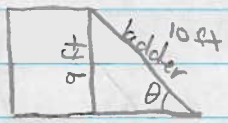
$v(-1, 15)$

D: $\mathbb{R}$

R: $y \leq 15$

Function

135.



$\sin\theta = \frac{9}{10}$

$\theta = \sin^{-1}\left(\frac{9}{10}\right)$

$\theta = 64.16°$

This is an unsafe situation b/c the ladder will make a 64.16° angle with the ground.

136. $5{,}000{,}000\left(\frac{1}{2}\right)^t$

a. 5,000,000 bytes

b. $1000 = 5{,}000{,}000\left(\frac{1}{2}\right)^t$

$.0002 = \left(\frac{1}{2}\right)^t$

$\log_{\left(\frac{1}{2}\right)}(.0002) = t$

$t = 12.3$ min

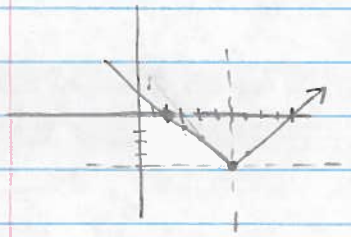
c. $0 = 5{,}000{,}000\left(\frac{1}{2}\right)^t$

$0 = \left(\frac{1}{2}\right)^t$

$\log_{\frac{1}{2}}(0) = t$

Error b/c the eq'n has a horizontal asymptote, so the hard drive can never technically be erased.

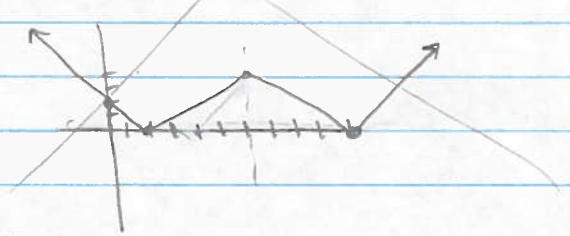
137. $f(x) = |x-6| - 4$ V-shape, $v(6,-4)$, up



a. shift the v-shape graph right 6, down 4.
Slope of the sides are ± 1

b. $y = ||x-6| - 4|$

Flip all parts below x-axis to be above the x-axis

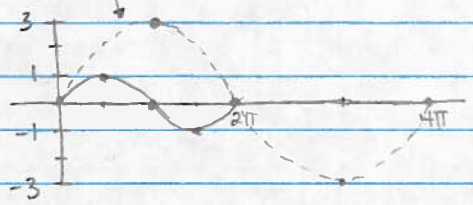


Lesson 7.2.3 p. 356-357: 144-151

144. a. $y = 3\sin\left(\frac{1}{2}x\right)$ - Amp = 3, Period = 4π

$P = \frac{2\pi}{\frac{1}{2}} = 2\pi \cdot 2 = 4\pi$

b.



c. Both have same shape. Period & Amp are different. Some x-int's are different.

145. $y = \sin(2\pi x)$ $P = \frac{2\pi}{2\pi} = 1$ b/c $P = \frac{2\pi}{b}$

146. Colleen's calc. is in radian mode and Jolleen's calc. is in degree mode. Jolleen has the correct answer... $\sin(30°) = .5$

147. $y = \sin 2(x-1)$ is the correct answer. To shift 1 unit right, you must subtract 1 from x before multiplying by anything.

148. Neither are correct!

$(2x-1)(x+3) = 4$

	$7x$	-7
$2x$	$2x^2$	$-2x$

$x \quad -1$

$-14x^2$, $7x$, $-2x$, $5x$

	$-x$	-3
$2x$	$2x^2$	$6x$

$x \quad 3$

$2x^2 + 5x - 3 = 4$

$2x^2 + 5x - 7 = 0$

$(2x+7)(x-1) = 0$

$x = \frac{-7}{2}, \quad x = 1$

149. a. $\log(8) + \log(125) = x$

$\log(1000) = x$

$10^x = 1000$

$\boxed{x = 3}$

b. $\log_{25}(125) = x$

$25^x = 125$

$(5^2)^x = 5^3$

$5^{2x} = 5^3$

$2x = 3$

$\boxed{x = \frac{3}{2}}$

c. $\frac{1}{2}\log(25) + \log(20) = x$

$\log\sqrt{25} + \log(20) = x$

$\log 5 + \log(20) = x$

$\log(100) = x$

$10^x = 100$

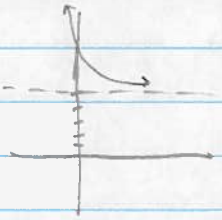
$\boxed{x = 2}$

d. $7^{\log_7(12)} = \boxed{12}$

Use the inverse relationship in the learning log!

150. $y = Km^x + b$ (3, 7.5) and (4, 6.25), Asymp @ $y = 5$

a.



Subtract 5 from each y-value & use (3, 2.5) and (4, 1.25)

0	20
2	÷.5
3	2.5
4	1.25

$b = \frac{1.25}{2.5} = .5$

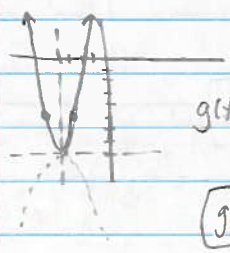
$\boxed{y = 20(.5)^x + 5}$

b. (8, w) means $x = 8$, so $w = 20(.5)^8 + 5$

$\boxed{w = 5.08}$

151. $f(x) = 3(x+4)^2 - 8$

a. V(-4, -8), up



many answers can work...

$\boxed{g(x) = -(x+4)^2 - 8}$

or

$\boxed{g(x) = -8}$

b. Any horizontal line below the Parabola will work... $\boxed{h(x) = -9}$

Any eqn so that the graphs don't touch will work!

$\boxed{y = -(x+4)^2 - 9}$

Lesson 7.2.4 p. 361–362: 158–166

158. a. Yes, it is possible to write a cosine function for this graph.

b. Amp = 1

$P = 2\pi$

horizontal shift = $\frac{\pi}{2}$ right

$y = -1\cos\left(x - \frac{\pi}{2}\right)$

c. $y = -1\sin x$

159. $y = 4\sin(6x)$ there are 6 cycles for 0 to 2π

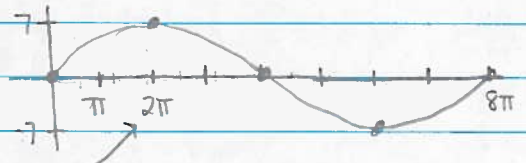
$P = \frac{2\pi}{b} = \frac{2\pi}{6} = \frac{\pi}{3}$

160. Amp = 7

$P = 8\pi$

$P = \frac{2\pi}{b}$

$b = \frac{2\pi}{P} = \frac{2\pi}{8\pi} = \frac{1}{4}$ cycle by 2π



$y = 7\sin\left(\frac{1}{4}x\right)$

161. a. $\pi \cdot \frac{180^\circ}{\pi} = 180^\circ$

b. $3\pi \cdot \frac{180^\circ}{\pi} = 540^\circ$

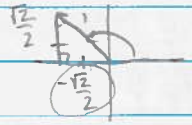
c. $30^\circ \cdot \frac{\pi}{180^\circ} = \frac{\pi}{6}$

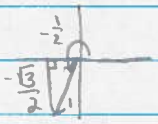
d. $\frac{\pi}{4} \cdot \frac{180^\circ}{\pi} = 45^\circ$

e. $225^\circ \cdot \frac{\pi}{180^\circ} = \frac{5\pi}{4}$

f. $\frac{3\pi}{2} \cdot \frac{180^\circ}{\pi} = 270^\circ$

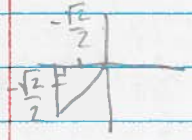
162. a $\cos\left(\frac{3\pi}{4}\right) = \boxed{-\frac{\sqrt{2}}{2}}$ b. $\tan\left(\frac{4\pi}{3}\right) = -\frac{\sqrt{3}}{2} \cdot \frac{-2}{1} = \boxed{\sqrt{3}}$

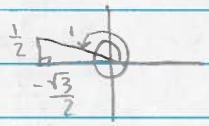




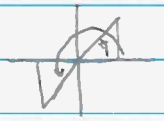
c. $\sin\left(\frac{11\pi}{6}\right) = \boxed{-\frac{1}{2}}$ d. $\sin\left(\frac{3\pi}{4}\right) = \boxed{\frac{\sqrt{2}}{2}}$

e. $\tan\left(\frac{5\pi}{4}\right) = \frac{-\sqrt{2}}{2} \cdot \frac{2}{-\sqrt{2}} = \boxed{1}$ f. $\tan\left(\frac{7\pi}{6}\right) = \frac{1}{2} \cdot \frac{-2}{\sqrt{3}} = \frac{-1}{\sqrt{3}} = \boxed{\frac{-\sqrt{3}}{3}}$



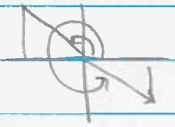


g. $\tan(\theta) = 1$ tan is 1 in 1st & 3rd Quad.



So, $\boxed{\theta = \frac{\pi}{4}, \frac{5\pi}{4}}$

h. $\tan(\theta) = -1$ tan is -1 in 2nd & 4th Quad.



So, $\boxed{\theta = \frac{3\pi}{4}, \frac{7\pi}{4}}$

163. $5x - 4y - 6z = -19$

$(-2x + 2y + z = 5) \cdot 5$

$3x - 6y - 5z = -16$

$5x - 4y - 6z = -19$

$-12x + 12y + 6z = 30$

$-7x + 8y = 11$

$7x - 4y = -9$

$4y = 2$

$\boxed{y = \frac{1}{2}}$

$3x - 6y - 5z = -16$

$-10x + 10y + 5z = 25$

$(-7x + 4y = 9) \cdot -1$

$-7x + 2 = 9$

$-7x = 7$

$\boxed{x = -1}$

$2 + 1 + z = 5$

$\boxed{z = 2}$

$\boxed{\left(-1, \frac{1}{2}, 2\right)}$

164. a. $x(2x+1)(3x-5)=0$

$x=0,\ x=-\frac{1}{2},\ x=\frac{5}{3}$

b. $(x-3)(x-2)=12$

-3	$-3x$	6
x	x^2	$-2x$
	x	-2

$x^2-5x+6=12$

$x^2-5x-6=0$

-6	$-6x$	-6
x	x^2	$1x$
	x	1

$-6x^2$, $-6x$, $1x$, $-5x$

$(x-6)(x+1)=0$

$x=6,\ x=-1$

165. a. $y=-(x+1)(x+2)-3$ or $y=-(x^2+3x+2)-3$ or $y=-x^2-3x-5$

b. $y=(x+1)^2$

c. $y=(x-1)(x+2)$ or $y=x^2+x-2$

166. $100\%+3.5\%=103.5\%=1.035$

a. $y=400{,}000(1.035)^x$ let $x=10$ $y=400{,}000(1.035)^{10}=\$564{,}239.50$

b. $800{,}000=400{,}000(1.035)^x$

$2=1.035^x$

$\log_{1.035}(2)=x$

$x=20.15$ years

c. $100\%-2\%=98\%$

$y=200{,}000(.98)^{10}$

$y=\$163{,}414.56$

Chapter 7 closure p. 365-366: 167-176

167. $y = \sin x$ starts at $(0,0)$
$y = \cos x$ starts at $(0,1)$ or $(0,-1)$

168. a. $225° \cdot \frac{\pi}{180°} = \boxed{\frac{5\pi}{4}}$ b. $75° \cdot \frac{\pi}{180°} = \boxed{\frac{5\pi}{12}}$

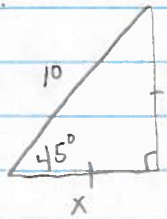
c. $-15° \cdot \frac{\pi}{180°} = \boxed{-\frac{\pi}{12}}$ d. $330° \cdot \frac{\pi}{180°} = \boxed{\frac{11\pi}{6}}$

169. a.  b.  c. 
$\frac{4\pi}{3}$
$\boxed{\sin\left(\frac{4\pi}{3}\right) = -\frac{\sqrt{3}}{2}}$
d. 

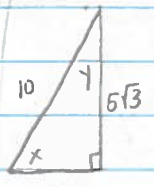
170. a. $\sin 60° = \boxed{\frac{\sqrt{3}}{2}}$ d. $\sin \frac{\pi}{4} = \boxed{\frac{\sqrt{2}}{2}}$
b. $\cos 180° = \boxed{-1}$ e. $\cos \frac{2\pi}{3} = \boxed{-\frac{1}{2}}$
c. $\tan 225° = \boxed{1}$ f. $\tan \frac{3\pi}{2} = \boxed{\text{undefined}}$

171. 

$\cos\theta = \frac{-\sqrt{3}}{2}$ if in Quad. 3
$\cos\theta = \frac{\sqrt{3}}{2}$ if in Quad. 4

172. a. 

$x = y = \frac{10}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$
$= \frac{10\sqrt{2}}{2}$
$\boxed{x \text{ or } y = 5\sqrt{2}}$

b. 

$\boxed{x = 60°}$
$\boxed{y = 30°}$

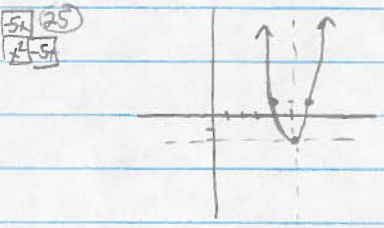
173. a. $y = 3x^2 - 30x + 73$, Parabola

$y = 3(x^2 - 10x + 25) + 73 - 75$

$y = 3(x-5)^2 - 2$

$V(5, -2)$

D: $\mathbb{R}$, R: $y \geq -2$, Function



b. $x^2 + y^2 - 6x + 4y + 4 = 0$, circle

$x^2 - 6x + y^2 + 4y = -4$

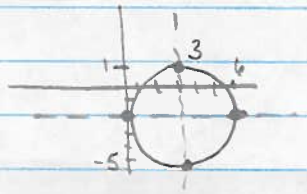
$+9 \quad +4 \quad +9 \quad +4$

$(x^2 - 6x + 9) + (y^2 + 4y + 4) = 9$

$(x-3)^2 + (y+2)^2 = 9$

$C(3, -2)$, $r = 3$

D: $0 \leq x \leq 6$, R: $-5 \leq y \leq 1$,
Not a function



174. a. $2 \cdot 3^x = 40.8$

$3^x = 20.4$

$\log_3(20.4) = x$

$x = 2.745$

b. $3x^4 = 27$

$\sqrt[4]{x^4} = \sqrt[4]{9}$

$x = 1.732$

c. $\log_5(2x+1) = 3$

$5^3 = 2x + 1$

$x = 62$

d. $\log(x) + \log(2x) = 5$

$\log(2x^2) = 5$

$10^5 = 2x^2$

$100000 = 2x^2$

$\sqrt{x^2} = \sqrt{50{,}000}$

$x = \pm 223.607$

$x = 223.607$ Ignore the neg. ans b/c we can't take the log. of a neg. #

175. (1, 22) and (3, 20.125) w/ horiz. Asympt @ $y = 20$

(1, 2) and (3, .125)

0	8
1	2
2	
3	.125

$\div .25$

$b^2 = \frac{.125}{2}$

$\sqrt{b^2} = \sqrt{.0625}$

$b = .25$

$y = 8(.25)^x + 20$