

# Unit 1

Multiple Choice

1. B	5. A	9. B or D	12. Mapping Rule	(12, -5)	
2. A	6. A	10. A		a. $(x, y) \rightarrow (\frac{1}{4}x+1, -2y+3)$	(4, 13)
3. A	7. B	11. A		b. $(x, y) \rightarrow (-x-7, 4y)$	(-19, -20)
4. C	8. C			c. $(x, y) \rightarrow (x-6, \frac{2}{5}y-8)$	(6, -10)
				d. $(x, y) \rightarrow (\frac{1}{2}x-5, -y-3)$	(1, 2)
				e. $(x, y) \rightarrow (3x+2, y-6)$	(38, -11)
			f. $(x, y) \rightarrow (x, 10y-8)$	(12, -58)	

13.  $h(x) = 2f(-2(x+4)) + 13$

(a)

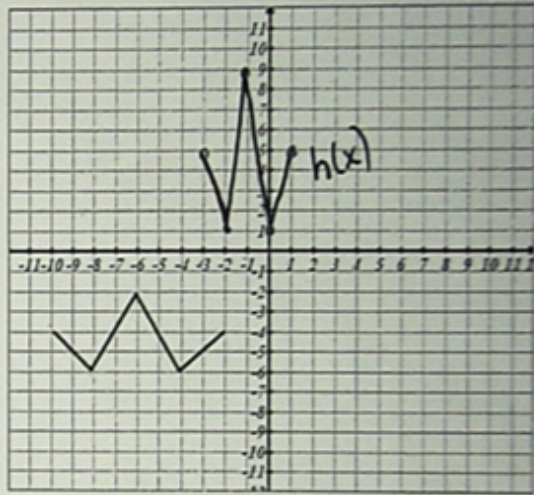
Domain  $f(x)$   $-10 \leq x \leq -2$   
 Range  $f(x)$   $-6 \leq y \leq -2$

Domain  $h(x)$   $-3 \leq x \leq 2$   
 Range  $h(x)$   $1 \leq y \leq 9$

$(x, y) \rightarrow (-\frac{1}{2}x-4, 2y+13)$

x	y
-10	-4
-8	-6
-6	-2
-4	-6
-2	-4

x	y
-1	5
0	1
-1	9
-2	1
-3	5



13. (b)  $m(x) = -1.5f(x-8) + 4$

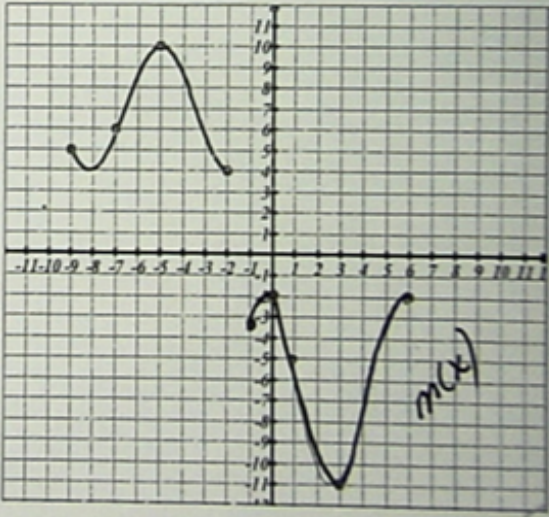
Domain  $f(x) = -9 \leq x \leq -2$   
 Range  $f(x) = 4 \leq y \leq 10$

Domain  $m(x) = -1 \leq x \leq 6$   
 Range  $m(x) = -11 \leq y \leq -2$

$(x, y) \rightarrow (x+8, -1.5y+4)$

x	y
-9	5
-8	4
-7	6
-5	10
-2	4

x	y
-1	-3.5
0	-2
1	-5
3	-11
6	-2



14. (a)  $y = 3f[-(x-5)] - 2$

(b)  $y = -f[-4(x-2)]$

(c)  $y = 9f[-\frac{1}{8}x] + 4$

15. Rotate, stretch then translate

(a)  $y = 3f[-2(x-4)] + 24$

(b)  $y = -3f(x+7) - 6$

16. (a)  $f(x) = \frac{2}{3}x + 5$

$y = \frac{2}{3}x + 5$

Inv:  $x = \frac{2}{3}y + 5$

$x - 5 = \frac{2}{3}y$

$3(x-5) = 2y$

$\frac{3(x-5)}{2} = y$

(b)  $f(x) = \sqrt{3x-12} - 20$

$y = \sqrt{3x-12} - 20$

Inv:  $x = \sqrt{3y-12} - 20$

$x + 20 = \sqrt{3y-12}$

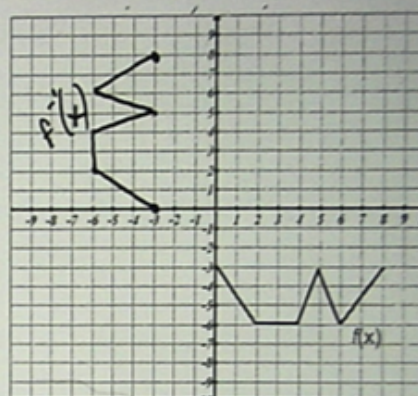
$(x+20)^2 = 3y-12$

$(x+20)^2 + 12 = 3y$

$\frac{(x+20)^2 + 12}{3} = y$

17. Domain  $f(x)$   $0 \leq x \leq 8$   
Range  $f(x)$   $-6 \leq y \leq 3$

Domain  $f^{-1}(x)$   $-6 \leq x \leq 3$   
Range  $f^{-1}(x)$   $0 \leq y \leq 8$



18.  $(8, -18)$  is on  $f(x)$

$(-18, 8)$  is on  $f^{-1}(x)$

$(x, y) \rightarrow (\frac{1}{6}x, 2y - 11)$

$(-18, 8) \rightarrow (-3, 5)$



## Unit 1 : Chapter 10

$$\begin{aligned}
 1. \quad y &= f(x) + g(x) \\
 &= (x^2 - 3x) + (4x + 5) \\
 &= x^2 - 3x + 4x + 5 \\
 y &= x^2 + x + 5
 \end{aligned}$$

$$\begin{aligned}
 2. \quad y &= f(x) + g(x) \\
 &= (x^2 - 8) + (-2 - x^2) \\
 &= x^2 - 8 - 2 - x^2 \\
 &= -10
 \end{aligned}$$

$$\begin{aligned}
 3. \quad h(x) &= \frac{f(x)}{g(x)} \\
 &= \frac{x^3 - 8}{x + 9} \quad \begin{array}{l} x+9 \neq 0 \\ x \neq -9 \end{array} \\
 &= \frac{x(x-9)(x+9)}{(x+9)} \\
 &= x(x-9)
 \end{aligned}$$

$$\begin{aligned}
 4. \quad h(x) &= f(g(x)) \\
 &= (-5-x)^2 - 8 \\
 &= 25 + 10x + x^2 - 8 \\
 &= x^2 + 10x + 17
 \end{aligned}$$

$$\begin{aligned}
 5. \quad k(x) &= f(x) - g(x) \\
 &= -\sqrt{x+2} - (x^2 - 2x + 7) \\
 &= -\sqrt{x+2} - x^2 + 2x - 7 \\
 \text{Domain } x+2 &\geq 0 \\
 x &\geq -2
 \end{aligned}$$

cannot take  
 $x+2 \geq 0$   
 $x \geq -2$

$$\begin{aligned}
 6. \quad (f \circ g)(x) &= f(g(x)) \\
 &= \frac{1}{x-3} + 3 \\
 &= \frac{1 + 3(x-3)}{x-3} \\
 &= \frac{1 + 3x - 9}{x-3} \\
 &= \frac{3x - 8}{x-3}
 \end{aligned}$$

$$\begin{aligned}
 7. \quad h(x) &= \frac{f(x)}{g(x)} \\
 &= \frac{-7\sqrt{x}-5}{\sqrt{x}+9} \\
 x &\geq 0; \quad \sqrt{x}+9 \neq 0 \\
 \sqrt{x} &\neq -9 \\
 x &\neq 81
 \end{aligned}$$

$$\begin{aligned}
 8. \quad 5g(x) - f(x) &= 5(2-x) - (9x^2 + 7x) \\
 &= 10 - 5x - 9x^2 - 7x \\
 &= -9x^2 - 12x + 10
 \end{aligned}$$

$$\begin{aligned}
 9. \quad f(f(-1)) &= f(-4) \\
 &= 11
 \end{aligned}$$

$$\begin{aligned}
 10. \quad h(x) &= f(x)g(x) \\
 &= (x^2 - 7)(2 - x^3) \\
 &= 2x^2 - x^5 - 14 + 7x^3 \\
 &= -x^5 + 7x^3 + 2x^2 - 14
 \end{aligned}$$

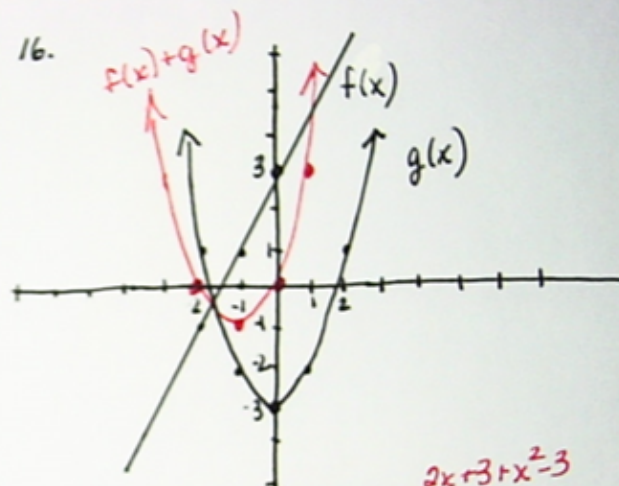
$$\begin{aligned}
 11. \quad h(x) &= \frac{f(x)}{g(x)} \\
 &= \frac{x^2 - 4}{x^2 - 3x + 2} \\
 &= \frac{(x-2)(x+2)}{(x-2)(x-1)} \quad x \neq 2, 1 \\
 &= \frac{x+2}{x-1}
 \end{aligned}$$

$$\begin{aligned}
 12. \quad & f(g(2)) \\
 &= f(-6) \\
 &= (-6)^2 - 7 \\
 &= 29
 \end{aligned}$$

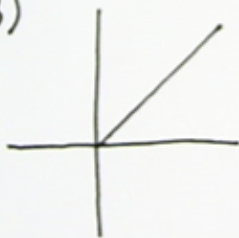
$$\begin{aligned}
 13. \quad & g(f(\pi)) \\
 &= \sqrt{4(\pi+3)^2} - 7 \\
 &= 2(\pi+3) - 7 \\
 &= 2\pi + 6 - 7 \\
 &= 2\pi - 1
 \end{aligned}$$

$$\begin{aligned}
 14. \quad & k(x) = f(g(x)) \\
 &= f(x+1) \\
 &= (x+1)^2 + 3(x+1) + 2 \\
 &= x^2 + 2x + 1 + 3x + 3 + 2 \\
 &= x^2 + 5x + 6
 \end{aligned}$$

$$\begin{aligned}
 15. \quad & f(g(x)) = g(f(x)) \\
 & f(x^2) = g(x+2) \\
 & x^2 + 2 = (x+2)^2 \\
 & x^2 + 2 = x^2 + 4x + 4 \\
 & -2 = 4x \\
 & -2/4 = x \\
 & x = -1/2
 \end{aligned}$$



17. (B)



$x$	$f(x) = 2x + 3$	$g(x) = x^2 - 3$	$f(x) + g(x)$
-2	-1	1	0
-1	1	-2	-1
0	3	-3	0
1	5	-2	3

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



## Exponential &amp; Logs:

Unit 2:

1. C      8. B  
 2. D      9. **B**  
 3. C      10. D  
 4. B      11. D  
 5. D      12. A  
 6. A      13. A  
 7. B      14. C

15. D  
 16. C  
 17. B

D)

$$18. (a) \log_3 81^{68} \quad (b) \log_4 \left[ \frac{25^{1/2} (24) 6^2}{30(9)} \right]$$

$$68 \log_3 81$$

$$68(4)$$

$$= 272$$

$$\log_4 16$$

$$= 2$$

$$(c) \frac{1}{5} (81 + 64)$$

$$\frac{1}{5} (145)$$

$$29$$

$$(f) (2 + 27^{-5} + 1)^{-3/2}$$

$$(25)^{-3/2}$$

$$= \frac{1}{25^{3/2}}$$

$$= \frac{1}{125}$$

$$19. (a) \frac{3^{5n+4} \times 3^{4(3-2n)}}{(3^3)^{n+5}} \quad (b) \frac{(7x^{3n})^3}{7} \quad (c) \left( \frac{32a^{10}b^{12}}{243a^5b^2} \right)^{3/5}$$

$$\frac{3^{5n+4} \cdot 3^{12-8n}}{3^{3n+15}} \quad \begin{matrix} 7 \cdot \\ \text{omit} \end{matrix} \quad \frac{32^{3/5} a^6 b^{36/5}}{243^{3/5} a^3 b^{6/5}}$$

$$= \frac{3^{-3n+16}}{3^{3n+15}} \quad \frac{8 a^3 b^{30/5}}{27}$$

$$= 3^{-6n+1} \quad \frac{8}{27} a^3 b^6$$

$$19. (d) \frac{-6(2a^4b^3)^3(9a^2b)}{(6a^5b)^2} \quad (e) \frac{x^5 \cdot x^{2n}}{(x^2)^{n+1}}$$

$$\frac{-6(8a^{12}b^9)(9a^2b)}{36a^{10}b^2} \quad \frac{x^{5+2n}}{x^{2n+2}}$$

$$\frac{-432a^{14}b^{10}}{36a^{10}b^2} \quad \frac{(5+2n)-(2n+2)}{x^{5+2n-2n-2}}$$

$$-12a^4b^8 \quad x^3$$

$$20. (a) \begin{aligned} 6(3)^{-2x+3} + 14 &= 50 \\ 6(3)^{-2x+3} &= 36 \\ 3^{-2x+3} &= 6 \\ -2x+3 &= \log_3 6 \\ -2x+3 &= 1.6309 \\ -2x &= -1.3691 \\ -x &= +0.685 \end{aligned}$$

$$(b) \begin{aligned} (6^2)^{x^2-8} &= 6^{11x-4} \\ 6^{2x^2-16} &= 6^{11x-4} \\ 2x^2-16 &= 11x-4 \\ 2x^2-11x-12 &= 0 \\ x &= \frac{11 \pm \sqrt{217}}{4} \end{aligned}$$

quad form  $\rightarrow$



$$\begin{aligned}
 (c) \quad 81^{x+3} &= 27^{\frac{1}{4}x} \\
 3^{4x+12} &= 3^{\frac{3}{4}x} \\
 4x+12 &= \frac{3}{4}x \\
 16x+48 &= 3x \\
 13x &= -48 \\
 x &= -\frac{48}{13}
 \end{aligned}$$

$$\begin{aligned}
 (d) \quad 2^{6(x-1)} &= 2^{5(2x-3)} \\
 2^{6x-6} &= 2^{10x-15} \\
 6x-6 &= 10x-15 \\
 -4x &= -9 \\
 x &= \frac{9}{4}
 \end{aligned}$$

$$\begin{aligned}
 (f) \quad 81^{2x+3} &= (\sqrt[4]{3})^x \\
 (3^4)^{2x+3} &= 3^{\frac{1}{4}x} \\
 3^{8x+12} &= 3^{\frac{1}{4}x} \\
 8x+12 &= \frac{1}{4}x \\
 32x+48 &= x \\
 32x-x &= -48 \\
 31x &= -48 \\
 x &= -\frac{48}{31}
 \end{aligned}$$

$$\begin{aligned}
 (g) \quad (5^2)^{5x-4} &= 5^{-3} \\
 5^{10x-8} &= 5^{-3} \\
 10x-8 &= -3 \\
 10x &= 5 \\
 x &= \frac{5}{10}
 \end{aligned}$$

$$\begin{aligned}
 (h) \quad \log_3(5x+14) - \log_3(x-6) &= 4 \\
 \log_3 \frac{5x+14}{x-6} &= 4 \\
 \frac{5x+14}{x-6} &= 2^4 \\
 5x+14 &= 16(x-6) \\
 5x+14 &= 16x-96 \\
 +5x-16x &= -96-14 \\
 -11x &= -110 \\
 x &= 10
 \end{aligned}$$

(e).  $\log_b 12x = 4$

$$12x = b^4$$

$$12x = 1296$$

$$x = 108$$

(i)  $\log_4(3x-2) + \log_4(x-2) = 3$

$$\log_4(3x-2)(x-2) = 3$$

$$(3x-2)(x-2) = 4^3$$

$$3x^2 - 8x + 4 = 64$$

$$3x^2 - 8x - 60 = 0$$

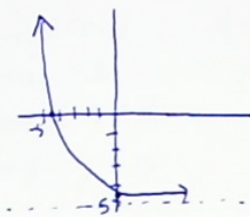
QF or Factor

$$x = -10/3, \textcircled{6}$$

1 adm.

21.  $y = 2(3)^{-(x+4)} - 5$

vertical stretch 2  
flipped y-axis  
left +4  
Down 5  
HA  $y = -5$   
y-int: -4.975  
Range  $y \geq -5$   
Domain  $x \in \mathbb{R}$



$y = 3^x \quad (x, y) \rightarrow$

Find x-int Let  $y = 0$

$$0 = 2(3)^{-(x+4)} - 5$$

$$5 = 2(3)^{-(x+4)}$$

$$2.5 = 3^{-(x+4)}$$

$$\log_3 2.5 = -(x+4)$$

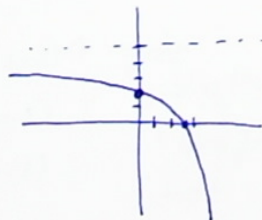
$$0.834 = -(x+4)$$

$$-0.834 = x+4$$

$$-4.834 = x$$

22.  $y = -4\left(\frac{1}{2}\right)^{x-3} + 5$

**VF** flipped x-axis  
VS = 4  
R 3  
u 5  
HA  $y = 5$   
y-int: 1  
x-int = 2.68



Domain:  $x \in \mathbb{R}$   
Range  $y \leq 5$

$$0 = -4\left(\frac{1}{2}\right)^{x-3} + 5$$

$$-5 = -4\left(\frac{1}{2}\right)^{x-3}$$

$$\frac{5}{4} = \left(\frac{1}{2}\right)^{x-3}$$

$$\log_{1/2}\left(\frac{5}{4}\right) = x-3$$

$$2.68 = x$$



$$23. y = -6(2)^{-3(x+2)} + 11$$

flipped x-axis  
flipped y-axis

$$HA y = 11$$

$$VS = 6$$

$$HS = \frac{1}{3}$$

$$L2$$

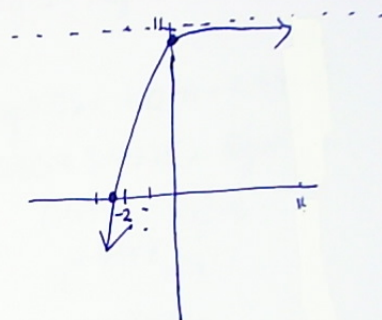
$$U11$$

$$x\text{-int: } -2.29$$

$$y\text{-int } 10.9$$

$$\text{Domain } x \in \mathbb{R}$$

$$\text{Range } y < 11$$



$$24. y = -2^{3(x+1)} + 10$$

flipped x-axis

$$HS = \frac{1}{3}$$

$$L1$$

$$U10$$

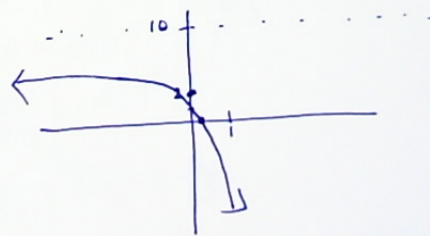
$$HA y = 10$$

$$x\text{-int} = 0.11$$

$$y\text{-int} = 2$$

$$\text{Domain } x \in \mathbb{R}$$

$$\text{Range } y < 10$$



$$25. y = 6 \log_4(x+2) - 7$$

$$VS = 6 \quad VA x = -2$$

$$L2$$

$$D7$$

$$\text{Domain } x > -2$$

$$\text{Range } y \in \mathbb{R}$$

$$x\text{-int } 0 = 6 \log_4(x+2) - 7$$

$$7 = 6 \log_4(x+2)$$

$$\frac{7}{6} = \log_4(x+2)$$

$$4^{\frac{7}{6}} = x+2$$

$$4^{\frac{7}{6}} - 2 = x$$

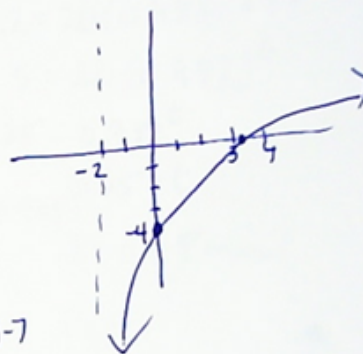
$$x = 3.04$$

$$y\text{-int}$$

$$y = 6 \log_4(0+2) - 7$$

$$= 6 \log_4 2 - 7$$

$$= -4$$



$$26. \log_b \frac{x \cdot x \cdot x}{x^{3/4} \cdot x^{1/4}}$$

$$\log_b \frac{x^3}{x^1}$$

$$= \log_b x^2$$

$$27. 3.6045 \log 5 = \log m - 3.4425$$

$$5 = 0.56$$

$$3.6045 \log 0.56 = \log m - 3.4425$$

$$3.6045 \log 0.56 + 3.4425 = \log m$$

$$2.5348 = \log m$$

$$10^{2.5348} = m$$

$$m = 342.6$$

$$28. 10000 = 250(1.025)^{3t}$$

$$40 = 1.025^{3t}$$

$$\log_{1.025} 40 = 3t$$

$$149.39 = 3t$$

$$t = 49.8 \text{ yrs}$$

$$29. D = 300(0.81)^{t/3}$$

$$20 = 300(0.81)^{t/3}$$

$$\frac{20}{300} = 0.81^{t/3}$$

$$\log_{0.81} \left( \frac{20}{300} \right) = \frac{t}{3}$$

$$12.85 = \frac{t}{3}$$

$$t = 38.55 \text{ days}$$

$$30. B = 20(0.988)^t + 17$$

$$(a) t=0 \quad B = 20(0.988)^0 + 17$$

$$= 37^\circ$$

$$(b) 22 = 20(0.988)^t + 17$$

$$5 = 20(0.988)^t$$

$$0.25 = 0.988^t$$

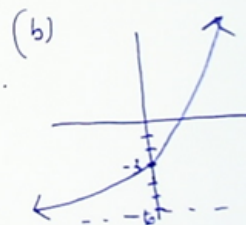
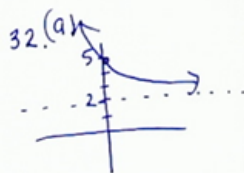
$$\log_{0.988} 0.25 = t$$

$$t = 114.8 \text{ min}$$

$$31. V = 15600(0.82)^t$$

$$= 15600(0.82)^5$$

$$= \$5783.54$$





1. a.  $150^\circ$       b.  $-385^\circ$       c.  $63^\circ$       d.  $-214^\circ$

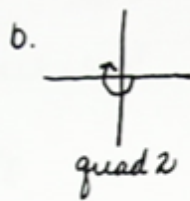
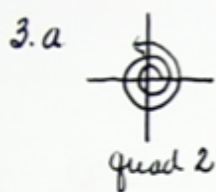
$$\frac{150\pi}{180} = \frac{5\pi}{6}$$

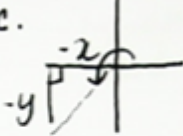
$$\frac{-385\pi}{180}$$

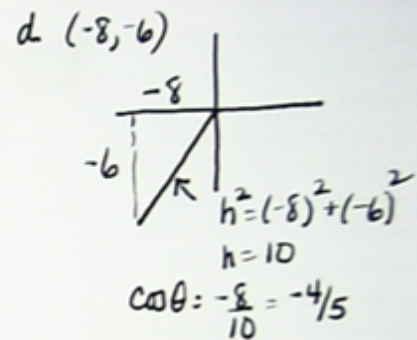
$$\frac{63\pi}{180} = 1.10$$

$$\frac{-214\pi}{180} = 3.74$$

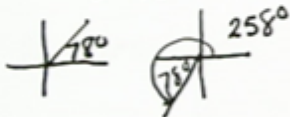
2. a.  $\frac{11\pi}{6} \times \frac{180}{\pi} = 330^\circ$       b.  $\frac{4\pi}{15} \times \frac{180}{\pi} = 48^\circ$       c.  $-\frac{13\pi}{18} \times \frac{180}{\pi} = -130^\circ$       d.  $4.17 \text{ rad} \times \frac{180}{\pi} = 238.9^\circ$       e.  $0.97 \text{ rad} \times \frac{180}{\pi} = 55.6^\circ$



c.   
 $\tan \theta = \frac{-4}{-2} = +4/x$

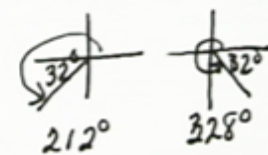


e.  $\tan \theta = 4.7046$   
 $\theta = \tan^{-1} 4.7046$   
 $\theta = 78^\circ$



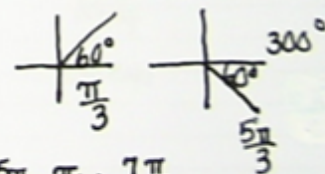
$-282^\circ, 78^\circ, 438^\circ$   
 $-102^\circ, 258^\circ, 618^\circ$

f.  $\sin \theta = -0.5300$   
 $\text{ref } \angle \theta = \sin^{-1}(0.5300)$   
 $\text{ref } \angle = 32^\circ$   
 $\sin$  is (-)



$212^\circ, 328^\circ$   
 $-148^\circ, 212^\circ, 572^\circ$   
 $-32^\circ, 328^\circ, 688^\circ$

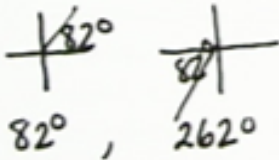
g.  $\sec \theta = 2.000$   
 $\cos \theta = \frac{1}{2}$   
 $\cos \theta = 0.5$   
 $\theta = 60^\circ$



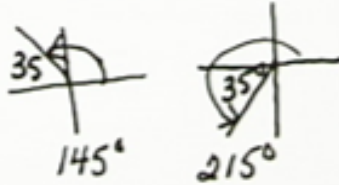
$-\frac{5\pi}{3}, \frac{\pi}{3}, \frac{7\pi}{3}$

$-\frac{\pi}{3}, \frac{5\pi}{3}, \frac{8\pi}{3}$

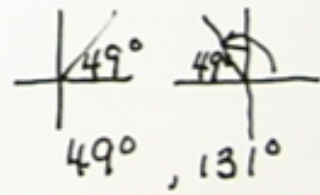
4. a.  $\tan \theta = 7.1154$   
 $\theta = 82^\circ$



b.  $\cos \theta = -0.8192$   
 ref  $\theta = 35^\circ$   
 cos is (-)



c.  $\csc \theta = 1.3250$   
 $\sin \theta = \frac{1}{1.3250}$   
 $\theta = 49^\circ$



5. a.  $\sin \theta \sec \theta \cot \theta = 1$   
 $\sin \theta \cdot \frac{1}{\cos \theta} \cdot \frac{\cos \theta}{\sin \theta} = 1$   
 $1 = 1$

b.  $\sin x + \frac{\cos^2 x}{\sin x} = \csc x$

$$\frac{\sin^2 x + \cos^2 x}{\sin x} = \csc x$$

$$\frac{1}{\sin x} = \csc x$$

$$\csc x = \csc x$$

c.  $\frac{1}{1+\sin \theta} + \frac{1}{1-\sin \theta} = 2 \sec^2 \theta$

$$\frac{1-\sin \theta + 1+\sin \theta}{(1+\sin \theta)(1-\sin \theta)} = 2 \sec^2 \theta$$

$$\frac{2}{1-\sin^2 \theta + \sin \theta - \sin \theta} = 2 \sec^2 \theta$$

$$\frac{2}{1-\sin^2 \theta} = 2 \sec^2 \theta$$

$$\frac{2}{\cos^2 \theta} = 2 \sec^2 \theta$$

$$2 \sec^2 \theta = 2 \sec^2 \theta$$

d.  $\sec \theta \tan \theta \sec^2 \theta \cot \theta = \sec \theta$

$$\sec \theta \cdot \frac{\sin \theta}{\cos \theta} \cdot \frac{1}{\cos^2 \theta} \cdot \frac{\cos \theta}{\sin \theta} = \sec \theta$$

$$\frac{1}{\cos \theta} = \sec \theta$$

$$\sec \theta = \sec \theta$$

e.  $\sec \theta - \tan \theta = \frac{1-\sin \theta}{\cos \theta}$

$$\frac{1}{\cos \theta} - \frac{\sin \theta}{\cos \theta} = \frac{1-\sin \theta}{\cos \theta}$$

$$\frac{1-\sin \theta}{\cos \theta} = \frac{1-\sin \theta}{\cos \theta}$$

f.  $\frac{\cot \theta}{\csc \theta \sec \theta} = \cos^2 \theta$

$$\frac{\sin \theta \cos \theta \cdot \frac{\cos \theta}{\sin \theta}}{\frac{1}{\sin \theta} \cdot \frac{1}{\cos \theta}} = \cos^2 \theta$$

$$\cos^2 \theta = \cos^2 \theta$$

$$\frac{\frac{\cos \theta}{\sin \theta}}{\frac{1}{\sin \theta} \cdot \frac{1}{\cos \theta}} = \frac{\frac{\cos \theta}{\sin \theta}}{\frac{1}{\sin \theta \cos \theta}}$$

$$= \frac{\frac{\cos \theta}{\sin \theta} \cdot \sin \theta \cos \theta}{\frac{\sin \theta \cos \theta}{\cos^2 \theta}}$$

$$6. (a) \text{ arc length} = (\text{radians})(\text{radius}) \quad (b). \text{ radius} = \frac{\text{arc length}}{\text{radians}}$$

$$a = \frac{43\pi}{180} \times 15$$

$$a = 11.26 \text{ cm}$$

$$= \frac{18}{3\pi/4}$$

$$= 7.6 \text{ cm}$$

$$8. (a) \sin \frac{\pi}{3} + \cos \frac{5\pi}{3}$$

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

$$= 0$$

$$(b). \frac{\cos 135^\circ}{\sin 330^\circ} - \frac{\sin 210^\circ}{\sec 45^\circ}$$

$$\frac{-\sqrt{2}/2}{-1/2} - \frac{-1/2}{2/\sqrt{2}}$$

$$\sqrt{2} + \frac{1}{2} \times \frac{\sqrt{2}}{2}$$

$$\sqrt{2} + \frac{\sqrt{2}}{4}$$

$$= \frac{5\sqrt{2}}{4}$$

$$(c). \sin^2 210^\circ + \tan 135^\circ \sin 330^\circ$$

$$(-1/2)^2 + \frac{\sqrt{3}/2}{-1/2} \cdot -1/2$$

$$1/4 - 1(-1/2)$$

$$1/4 + 1/2$$

$$3/4$$

$$d. \csc \frac{2\pi}{3} \cos \frac{11\pi}{6} - \sin \frac{\pi}{4} \cos \frac{3\pi}{4}$$

$$2/\sqrt{3} \cdot \frac{\sqrt{3}}{2} - \frac{\sqrt{2}}{2} \cdot \frac{-\sqrt{2}}{2}$$

$$1 + \frac{2}{4}$$

$$1 + 1/2 = \frac{3}{2}$$

$$e. \sin^2 60^\circ + \cos^2 60^\circ - \tan^2 60^\circ$$

$$\left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{2}\right)^2 - \left(\frac{\sqrt{3}/1}{1/1}\right)^2$$

$$\frac{3}{4} + \frac{1}{4} - (\sqrt{3})^2$$

$$1 - 3 = -2$$

$$8. \sqrt{2} \sec 765^\circ \cos 600^\circ - 4\sqrt{3} \tan 690^\circ$$

$$\sqrt{2} \cdot \frac{1}{\sqrt{2}} \cdot \frac{1}{2} + 4\sqrt{3} \cdot \frac{-1/2}{\sqrt{3}/2}$$

$$-1 + 4\sqrt{3} \cdot \frac{1}{\sqrt{3}}$$

$$-1 + 4$$

$$3$$

$$9. \cot \frac{5\pi}{4} \cos \frac{5\pi}{3} - \sin \frac{3\pi}{2} \cos \pi$$

$$\frac{-\sqrt{2}/2}{-1/\sqrt{2}} \cdot \frac{1}{2} - (-1)(-1)$$

$$1 \cdot \frac{1}{2} - 1$$

$$-1/2$$



### Aug. Part 2 Sinusoidal Functions



Eq'n: Amp: 24

period: 14  $K = \frac{360}{14}$

ps:  $\cos + 5$

SA  $y = 25$

$$y = 24 \cos \left[ \frac{360}{14}(x-5) \right] + 25$$

Started timing herself at  $x=0$   $y = 24 \cos \left[ \frac{360}{14}(0-5) \right] + 25$   
 $y = 10.04m$

at 20 sec

$$h = 24 \cos \left[ \frac{360}{14}(20-5) \right] + 25$$

$$= 46.6m$$

2.  $h = -4 \cos 30(t-15) + 7$   $(t, h) \rightarrow \left( \frac{1}{30}t + 15, -4h + 7 \right)$

a) amp = 4

period =  $\frac{360}{30} = 12$

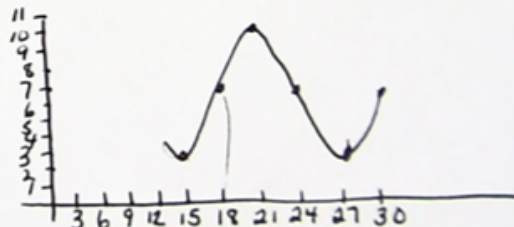
ps: +15

SA  $y = 7$

vertical trans +7

horiz. trans +15

t	h	t	h
0	1	15	3
90	0	18	7
180	-1	21	11
270	0	24	7
360	1	27	3



$$3. y = 6 \cos 18(\theta + 5^\circ) - 4$$

(a) Amp = 6  
 period =  $\frac{360}{18} = 20$

SA:  $y = -4$

vert. trans:  $y = -4$

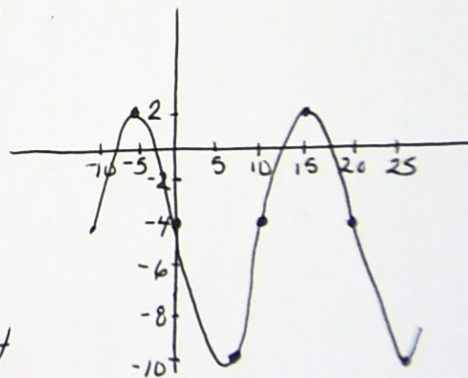
ph. shift -5

(b) Domain  $\theta \in \mathbb{R}$

Range:  $-10 \leq y \leq 2$

(c)  $(\theta, y) \rightarrow (\frac{1}{18}\theta - 5, 6y - 4)$

$\theta$	$y$	$\theta$	$y$
0	1	-5	2
90	0	0	-4
180	-1	5	-10
270	0	10	-4
360	1	15	2



(d)  $\theta = 60^\circ$   $y = 6 \cos[18(60+5)] - 4$

(e)  $y = 4$   $4 = 6 \cos[18(\theta + 5)] - 4$   
 $y$  cannot equal 4 because  
 range is  $-10 \leq y \leq 2$

$$4 + 4 = 6 \cos[18(\theta + 5)]$$

$$\frac{8}{6} = \cos[18(\theta + 5)]$$

$$\cos^{-1}\left(\frac{4}{3}\right) = 18(\theta + 5)$$

$\uparrow$  undefined

$$4. y = -5\sin 30(\theta - 15^\circ) + 3$$

a) amp = 5

period =  $\frac{360}{30} = 12$

SA:  $y = 3$

vert trans up 3 (+3)

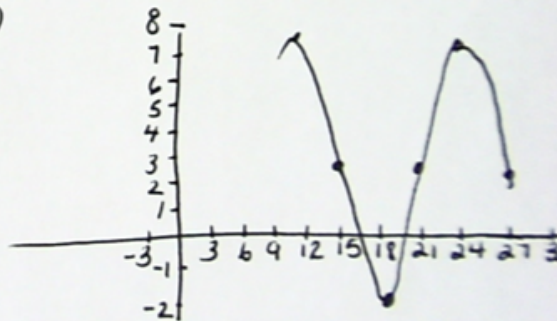
ph-sh: +15

(b) Domain  $\theta \in \mathbb{R}$

Range  $-2 \leq y < 8$

(c)  $(\theta, y) \rightarrow (\frac{1}{30}\theta + 15, -5y + 3)$

$\theta$	$y$	$\theta$	$y$
0	0	15	3
90	1	18	-2
180	0	21	3
270	-1	24	8
360	0	27	3



(d) solve  $\theta = 60$   
 $y = -5\sin[30(60-15)] + 3$   
 $y = 8$

(e)  $y = 4$

$$4 = -5\sin[30(\theta - 15)] + 3$$

$$4 - 3 = -5\sin[30(\theta - 15)]$$

$$\frac{-1}{5} = \sin[30(\theta - 15)]$$

$$\sin^{-1}(-0.2) = 30(\theta - 15)$$

$$-11.54 = 30(\theta - 15)$$

$$\frac{-11.54}{30} = \theta - 15$$

$$\frac{-11.54}{30} + 15 = \theta$$

$$14.6 = \theta$$

Just 1 angle

$$\theta = 14.6, 26.6, \dots \quad 14.6 \pm 12x$$

OR

$$21.38 \pm 12x$$

$$\left. \begin{array}{l} \sin^{-1}(-0.2) \\ = 191.54 \\ \frac{191.54 + 15}{30} = \theta \end{array} \right\}$$



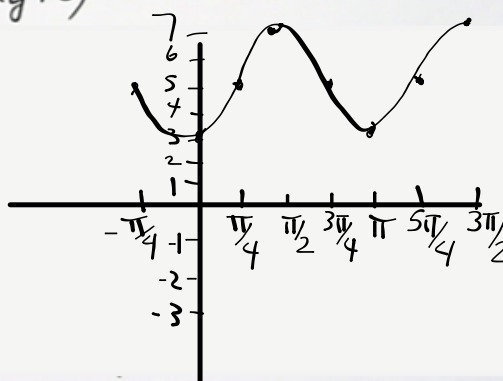
5. (a) Amp: 5  
 period: 16  $k = \frac{360}{16} =$   
 cps: sin 0, 16  
 cos 4, 20  
 SA:  $y = 3$   
 $y = 5 \sin 22.5(\theta) + 3$   $y = 5 \cos 22.5(\theta - 4) + 3$   
 $(\theta - 16)$   $(\theta - 20)$

(b) Amp = 6  
 period 18  $k = \frac{360}{18} = 20$   
 cps: sin 4.5, 22.5  
 cos 9, 27  
 SA:  $y = 8$   
 $y = 6 \sin 20(x - 4.5) + 8$   $y = 6 \cos 20(x - 9) + 8$

6.  $y = 2 \sin 2(\theta - \pi/4) + 5$

$(\theta, y) \rightarrow (\frac{1}{2}\theta + \frac{\pi}{4}, 2y + 5)$

$\theta$	$y$	$\theta$	$y$
0	0	$\pi/4$	5
$\pi/2$	1	$2\pi/4$	7
$\pi$	0	$3\pi/4$	5
$3\pi/2$	-1	$4\pi/4$	3
$2\pi$	0	$5\pi/4$	5

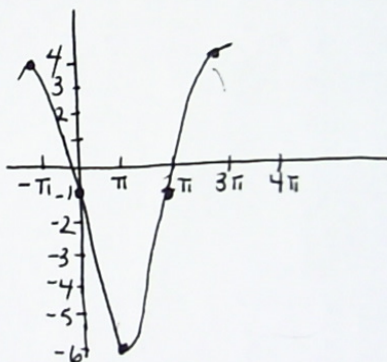


6 (b) same as (a)

$$(c) y = 5 \cos \frac{1}{2}(\theta + \pi) - 1$$

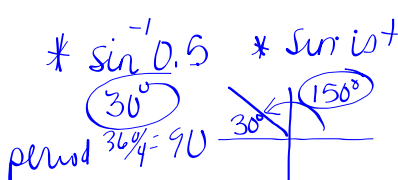
$$(\theta, y) \rightarrow (2\theta - \pi, 5y - 1)$$

$\theta$	$y$	$\theta$	$y$
0	1	$-\pi$	4
$\frac{\pi}{2}$	0	0	-1
$\pi$	-1	$\pi$	-6
$\frac{3\pi}{2}$	0	$2\pi$	-1
$2\pi$	1	$3\pi$	4



$$7. y = \frac{1}{4} \sin \frac{1}{9}(\theta - 15) - 3$$

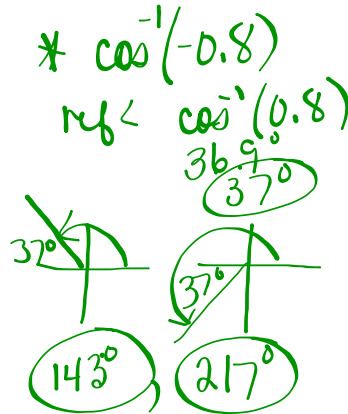
$y = -12 \sin^4(\theta - 10) + 2$   
 for  $y = -4$   
 $-4 = -12 \sin^4(\theta - 10) + 2$   
 $\frac{-6}{-12} = \frac{-12 \sin^4(\theta - 10)}{-12}$   
 $0.5 = \sin^4(\theta - 10)$   
 $\sin^{-1} 0.5 = 4(\theta - 10)$   
 $30$  or  $150$   
 $\textcircled{1} \frac{30}{4} = \frac{4(\theta - 10)}{4}$  or  $\textcircled{2} \frac{150}{4} = \frac{4(\theta - 10)}{4}$   
 $7.5 = \theta - 10$        $37.5 = \theta - 10$   
 $17.5 = \theta$              $47.5 = \theta$

$\ast \sin^{-1} 0.5$        $\ast \sin^{-1} 0.5$   


Every Single  $\angle$ :  
 $17.5 + 90x$   
 $47.5 + 90x$

$y = 5 \cos 2(\theta + 3) + 6$   
 Solve for  $y = 2$

$2 = 5 \cos 2(\theta + 3) + 6$   
 $2 - 6 = 5 \cos 2(\theta + 3)$   
 $\frac{-4}{5} = \cos 2(\theta + 3)$   
 $-0.8 = \cos 2(\theta + 3)$   
 $\cos^{-1}(-0.8) = 2(\theta + 3)$   
 $\textcircled{1} 143 = 2(\theta + 3)$  or  $\textcircled{2} 217 = 2(\theta + 3)$   
 $\theta = 68.5$              $\theta = 105.5$



period  $\frac{360}{2}$   
 $= 180$

$68.5 + 180x$   
 $105.5 + 180x$

$y = \sin \theta$

$\theta$	$y$
0	0
$\frac{\pi}{2}$ 90	1
$\pi$ 180	0
$\frac{3}{2}\pi$ 270	-1
$2\pi$ 360	0