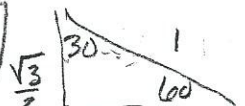



7-122) continued c)  $8 - \sqrt{9-2x} = x+3$   
 $(-\sqrt{9-2x}) = (x-5)^2$   
 $9-2x = x^2 - 10x + 25$   
 $0 = x^2 - 8x + 16$   
 $0 = (x-4)(x-4)$   
 $x=4$

7-123) a)  $\tan \frac{2\pi}{3} = \frac{\sqrt{3}}{2} \div \frac{1}{2} = \frac{\sqrt{3}}{2} \cdot 2 = \sqrt{3}$



b)  $\tan \frac{7\pi}{6} = \frac{1}{2} \div \frac{\sqrt{3}}{2} = \frac{1}{2} \cdot \frac{2}{\sqrt{3}} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$



7-124)  $(125, 15)$   
 $(250, 0)$   
 vertex =  $(125, 15)$

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

$$0 = a(250-125)^2 + 15$$

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

$$-15 = 15625a$$

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

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

Thurs. 3/26 (7.2.2 7-129  $\rightarrow$  7-137)

7-129) a)  $y = \sin(x - \frac{\pi}{4}) + 2$

b)  $y = 1.5(\sin(\frac{\pi}{2})) + 0.5$

c)  $y = \sin(x + \frac{5\pi}{6}) + 2$  shifted up 2 and left  $\frac{5\pi}{6}$

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

or  $y = 3\sin(x - \frac{4\pi}{6}) - 1 = 3\sin(x - \frac{2\pi}{3}) - 1$

$$7-130) y = \cos \theta$$

$$y = \cos(\theta + 360)$$

No difference because 360 is the period of  $y = \cos \theta$  so shifting it 360° left lines up the cycles perfectly

$$7-131) y = 2x^2 - 4x + 5$$

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

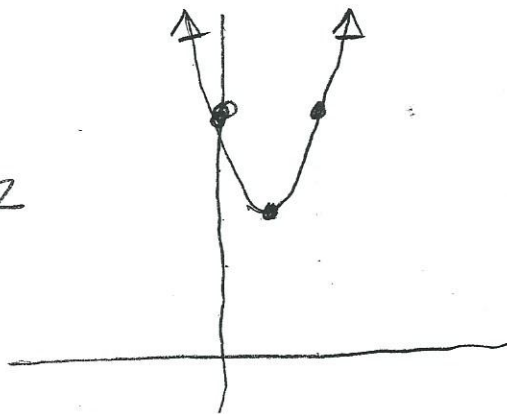
$$y = 2(x^2 - 2x + 1) + 5 - 2$$

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

$$v(1, 3)$$

$$y\text{-int}(0, 5)$$

No x intercept



$$7-132) a) y = 2x^3 - 10x^2 - x$$

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

$$AC = -2$$

can't factor - use Quad Formula

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

$$x = \frac{10 \pm \sqrt{100 + 8}}{4} = \frac{10 \pm \sqrt{108}}{4} = \frac{10 \pm \sqrt{36 \cdot 3}}{4}$$

$$x = \frac{10 \pm 6\sqrt{3}}{4} = \left( \frac{5 \pm 3\sqrt{3}}{2}, 0 \right)$$

$$y = 0 \text{ when } x = 0 \text{ so } y\text{-int. } (0, 0)$$

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

$$x\text{-int: } \Rightarrow z = \log_3(x-1)$$

$$3^z = x-1$$

$$x\text{-int}(10, 0)$$

$$9 = x-1$$

$$10 = x$$

$$y\text{-int} \Rightarrow y + 2 = \log_3(0-1)$$

$$y + 1 = \log_3 -1 \quad \text{no}$$

No y-intercept!

7-133)

$$y = 9.50 (b)$$

$$y = 9.50 (1.04)^x$$

$$\frac{19}{9.5} = \frac{9.50 (1.04)^x}{9.5}$$

$$2 = 1.04^x$$

$$2y = 9.50 (1.04)^x$$

$$\log 2 = \log 1.04^x$$

$$\log 2 = x \log 1.04$$

$$x = \frac{\log 2}{\log 1.04} = 17.67 \text{ years}$$

7-134) a)  $y = -2x^2 - x + 13$

$$y = -2 \left( x^2 + \frac{x}{2} \right) + 13$$

$$y = -2 \left( x^2 + \frac{x}{2} + \frac{1}{4} \right) + 13 + \frac{1}{2}$$

$$y = -2 \left( x + \frac{1}{2} \right)^2 + \frac{27}{2}$$

Domain: all real #s

Range:  $-\infty < y < 27/2$

Yes a Function

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

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

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

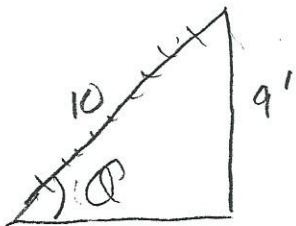
$$y = -3(x + 1)^2 + 15$$

D: all real #'s

R:  $-\infty < y < 15$

Yes a function

7-135)



$$\sin^{-1} \frac{9}{10} = \theta = 64^\circ$$

unsafe!

7-136) a) 5,000,000

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

$$t = \frac{\log \frac{1000}{5,000,000}}{\log \frac{1}{2}}$$

$$\log \frac{1000}{5,000,000} = t \log \frac{1}{2}$$

$$t = 12.3 \text{ minutes}$$

c) ...

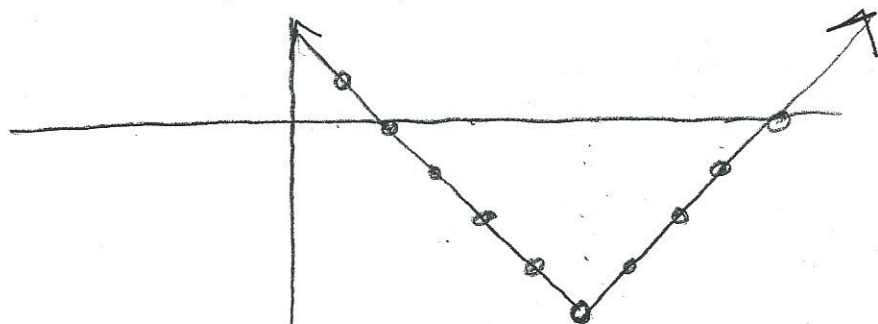
$$7-136(c) \quad 1 = 5000,000 \left(\frac{1}{2}\right)^t$$

$$\frac{\log \frac{1}{5000,000}}{\log \frac{1}{2}} = t = 22 \text{ minutes}$$

Technically never, but after about 22 min

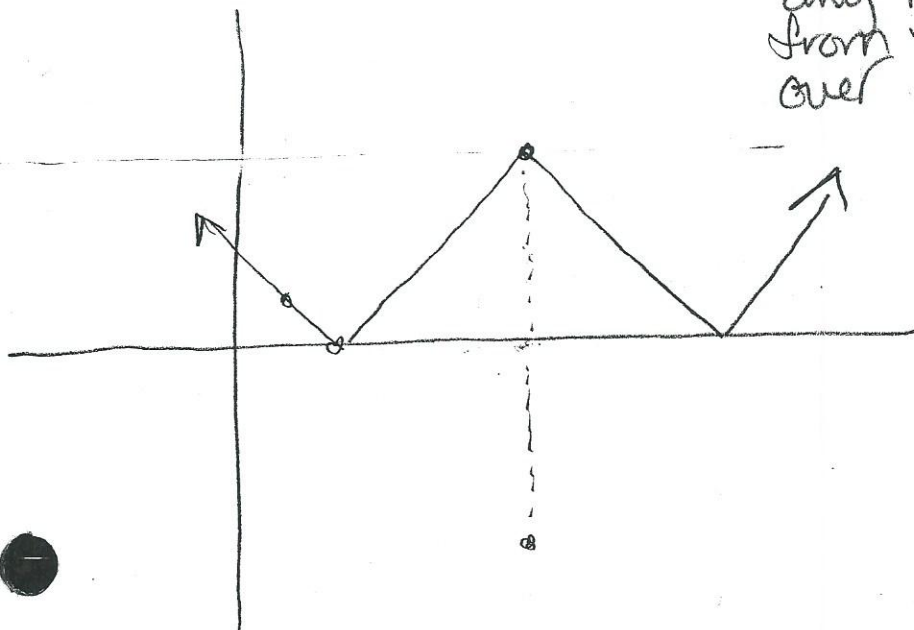
$$7-137) \quad f(x) = |x-6| - 4$$

- a) vertex is at  $(6, -4)$  and the slope is  $\pm 1$  with the graph opening up



$$b) \quad g(x) = ||x-6| - 4|$$

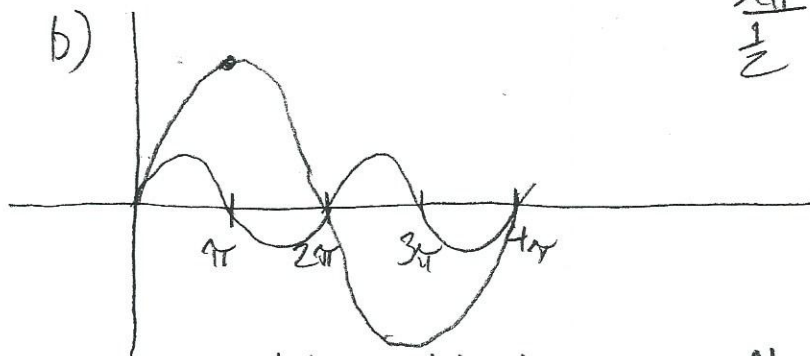
The second absolute value makes you flip any negative values from the 1st graph over



Friday 3/27 7.2.3 (7-144 → 7-151) Delete 151

7-144) a) The amplitude is 3 and the period is  $2(2\pi) = 4\pi$

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



c) The period & amplitudes are different as well as some of the x-intercepts but they have the same basic shape

7-145)  $y = \sin 2\pi x$  period  $\frac{2\pi}{2\pi} = 1$

period = 1

7-146) Colleen's calculator was in radian mode & Jolleen's was in degree mode. Colleen's was wrong

7-147)  $y = \sin 2(x-1)$  is correct. To shift the graph one unit to the right subtract 1 from  $x$  before multiplying by anything!

7-148) They are both wrong. You need to distribute, subtract 4 so you can use the zero product prop

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

$$2x^2 + 6x - x - 3 - 4 = 0$$

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

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

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

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

$$AC = \frac{-14}{2} = -7$$

$$\boxed{\begin{matrix} x = 1 \\ x = -7/2 \end{matrix}}$$

$$7-149) a) \log 1000 + \log 125 = \log 1000 = 3$$

$$10^3 = 1000$$

$$b) \log_{25} (125)$$

$$25^x = 125$$

$$25^{3/2} = 125$$

$$\boxed{3/2 = 1.5}$$

$$c) \frac{1}{2} \log 25 + \log 20$$

$$\log 25^{1/2} + \log 20 = \log 5 + \log 20 = \log 100 = 2$$

$$d) 7^{\log_7 12} = x$$

$$(\log_7 12) \log 7 = \log x$$

$$\log_7 12 = \frac{\log x}{\log 7}$$

$$\text{change of base} \Rightarrow \frac{\log 12}{\log 7} = \frac{\log x}{\log 7} \quad \text{so } \boxed{x = 12}$$

$$7-156) y = km^x + 5$$

$$6.25 = km^4 + 5$$

$$1.25 = km^4$$

$$k = \frac{1.25}{m^4} = \frac{2.5}{m^3}$$

$$\frac{1.25}{2.5} = \frac{m^4}{m^3}$$

$$7.5 = km^3 + 5$$

$$2.5 = km^3$$

$$m = 1.5$$

$$k = \frac{2.5}{(1.5)^3} = 20$$

$$y = 20(1.5)^x + 5$$

$$7-157) \dots$$

Monday 3/30 7.2.4 (7-158 → 7-166)

- 7-158) a) yes      b)  $y = \cos(x + \frac{\pi}{2})$  shifted  $\frac{\pi}{2}$  units to the left  
 c)  $y = -\sin x$  (reflected across x-axis)

7-159) There are 6 cycles  
 period =  $\frac{2\pi}{6} = \frac{\pi}{3}$

7-160)  $y = 7 \sin \frac{x}{4}$       there are 4 cycles in  $2\pi$   
 if period is  $\frac{2\pi}{4}$

7-161) a)  $\pi = 180^\circ$        $\frac{2\pi}{8\pi} = \frac{1}{4}$

b)  $3\pi = 3(180) = 540^\circ$

c)  $30/180 = \pi/6$       e)  $\frac{225}{360} = \frac{x}{2\pi}$

d)  $\frac{\pi}{4} = 45^\circ$

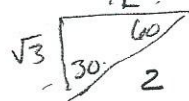
$x = \frac{450\pi}{360} = \frac{45\pi}{36} = \frac{5\pi}{4}$

f)  $\frac{3\pi}{2} = \frac{3(180)}{2} = 270^\circ$

7-162) a)  $\cos(\frac{3\pi}{4})$  ref. angle is  $45^\circ$        $-\frac{\sqrt{2}}{2}$

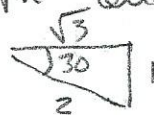
b)  $\tan(\frac{4\pi}{3})$        $\frac{4\pi}{3} = 240^\circ$  ref angle =  $60^\circ$ ; 3rd quad.

$= \sqrt{3}$



c)  $\sin \frac{11\pi}{6}$        $\frac{11\pi}{6} = 330^\circ$       ref angle =  $30^\circ$  in 4th quad.

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

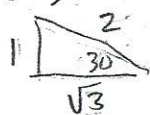


d)  $\sin \frac{3\pi}{4}$       ref angle =  $45^\circ$

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

e)  $\tan \frac{5\pi}{4}$       ref angle =  $45^\circ$        $= \frac{\sqrt{2}}{\sqrt{2}} = 1$

f)  $\tan(\frac{7\pi}{6})$       ref angle =  $30^\circ$  in 2nd quad



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

7-162 cont'd g)  $\tan(\theta) = 1$   $\frac{\pi}{4} = \theta$

h)  $\tan(\theta) = -1$   $\frac{3\pi}{4}$  or  $\frac{7\pi}{4}$   
 $\uparrow$   $\uparrow$   
 $135^\circ$   $315^\circ$

7-163) ①  $5x - 4y - 6z = -19$   
 ②  $-2x + 2y + z = 5$   
 ③  $3x - 6y - 5z = -16$

①  $\rightarrow$  ②  $5x - 4y - 6z = -19$   
 $-4x + 4y + 2z = 10$   


---

 $x - 4z = -9$

②  $\rightarrow$  ③  $-6x + 6y + 3z = 15$   
 $3x - 6y - 5z = -16$   


---

 $-3x - 2z = -1$

$3x - 12z = -27$   
 $-3x - 2z = -1$   


---

 $-14z = -28$   
 $-14 \quad -14$   
 $z = 2$

$x - 4(2) = -9$   
 $x = -1$

$-2(-1) + 2y + z = 5$   
 $z + 2y + z = 5$   
 $2y = 1$   
 $y = \frac{1}{2}$

$z = 2$   
 $(-1, \frac{1}{2}, 2)$

7-164) a)  $x(2x+1)(3x-5) = 0$

$x = 0$

$2x+1=0$   
 $x = -\frac{1}{2}$

$3x-5=0$   
 $x = \frac{5}{3}$

b)  $(x-3)(x-2) = 12$   
 $x^2 - 2x - 3x + 6 = 12 = 0$   
 $x^2 - 5x - 6 = 0$   
 $(x-6)(x+1) = 0$   
 $x = 6 \quad x = -1$

c)  $x^2 + 4x + 4 = 0$   
 $(x+2)(x+2) = 0$   
 $x = -2$

7-165 a)  $y = -x^2 - 2$

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

c)  $y = -(x+1)(x+3)$



7-166) (2005, 400,000)

$$y = ab^x$$

$$y = 400,000(1.035)^x$$

a)  $y = 400,000(1.035)^{10} = \$564,240$

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

$$\log 2 = \log 1.035^x$$

$$\log 2 = x \log 1.035$$

$$x = \frac{\log 2}{\log 1.035}$$

= 20 years or 2025

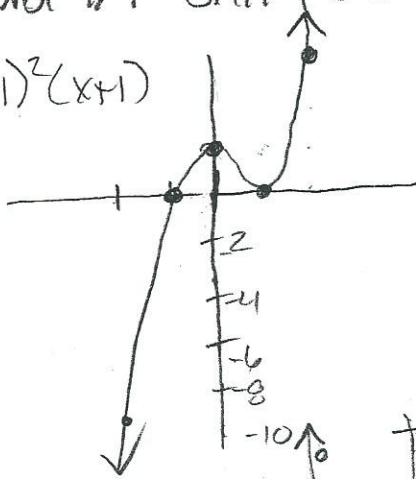
c)  $y = 200,000(1.98)^x$   
 $y = 200,000(1.98)^{10} = 163,414$

$200,000 - 163,414 = \$36,586$

8-8) Tues/Wed 3/31 and 4/1 E.I.I (8-8 → 8-16)

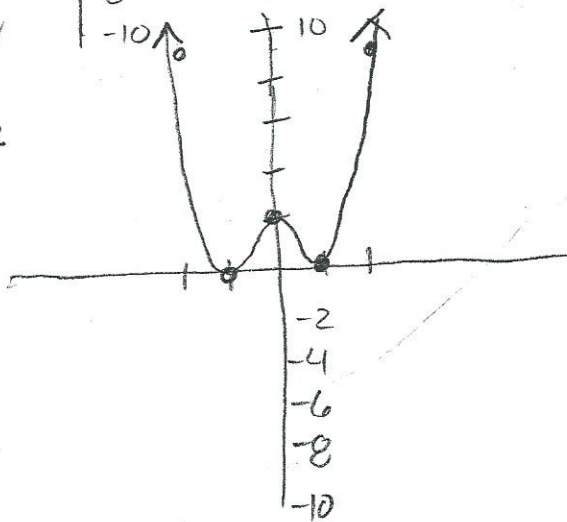
a)  $y = (x-1)^2(x+1)$

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



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

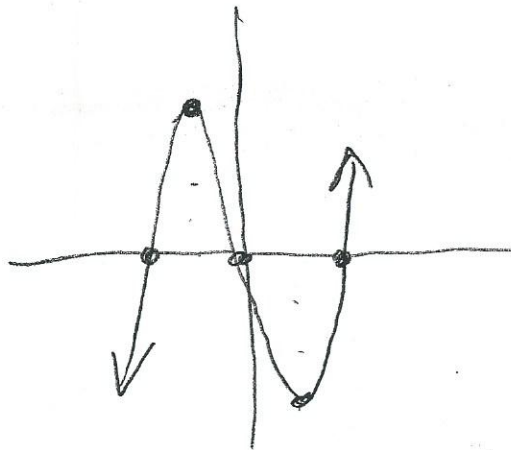
x	y
-2	9
-1	0
0	1
1	0
2	9



8-8 cont'd

c)  $y = x^3 - 4x$

x	y
-2	0
-1	3
0	0
1	-3
2	0



d) a)  $y = x^3$   
 b)  $y = x^4$   
 c)  $y = x^3$

8-9) a) Polynomial    b) Polynomial    c) Not a Polynomial  
 exp. is a variable

d) Not a Polynomial - exp is not a whole #

e) Polynomial

f) Not a Polynomial - exp is in the denominator so it is neg & not a whole #

g)  $y = x^4 + 3x^2$  ✓  
 $y = x^{3/2} + .4x$

8-10) a) 0, 1 or  $\infty$  coincide.

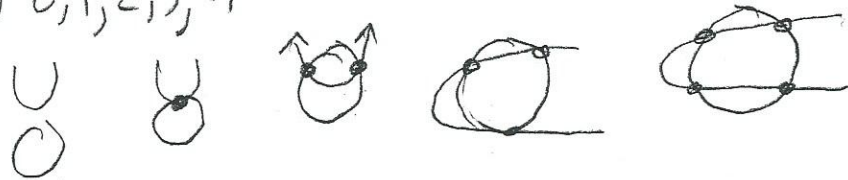
b) 0, 1, 2



c) 0, 1, 2, 3,



d) 0, 1, 2, 3, 4



8-11)

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

$x^2 - 5 = x + 1$   
 $x^2 - x - 6 = 0$   
 $(x - 3)(x + 2) = 0$

$x = 3$   
 $x = -2$

$y = 3 + 1 = 4$

$y = -2 + 1 = -1$

$(3, 4)$   
 $(-2, -1)$

8-12)

1st  
adds 2

2nd  
multiplies  
by 3

3rd  
take square  
root

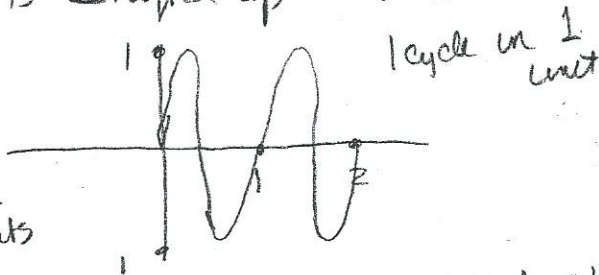
4th  
Subtract 1

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

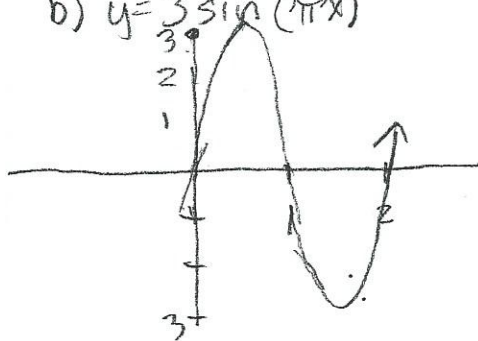
$$g^{-1}(x) = \sqrt{3(x+2)} - 1$$

8-13) The second graph is shifted up 5 units from the 1st

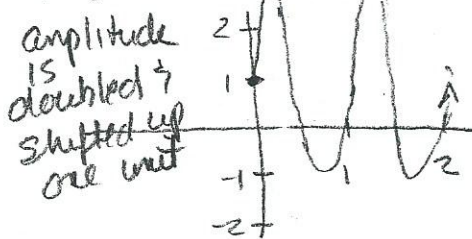
8-14) a)  $y = \sin(2\pi x)$



b)  $y = 3\sin(\pi x)$   
1 cycle in 2 units



c)  $y = 2\sin(2\pi x) + 1$



8-15) -23, -19, -15

a) add 4

$$t(n) = 4n - 27$$

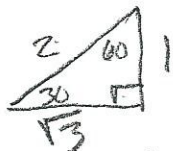
b)  $10,000 = 4n - 27$

$$\frac{10,027}{4} = \frac{4n}{4}$$

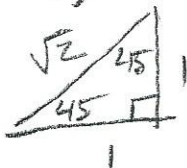
$$n = 2507$$

more than 2507 times

8-16) a)  $\cos \theta = \frac{1}{2}$   $\theta = 60$  or  $\theta = 300$



b)  $\tan \theta = -1$   $\theta = 135^\circ$  or  $\theta = 315^\circ$



c)  $\sin \theta = \frac{\sqrt{3}}{2}$   $\theta = 60$  or  $\theta = 120^\circ$

d)  $\cos \theta = -\frac{\sqrt{3}}{2}$   $\theta = 30^\circ$  or  $\theta = 210^\circ$