UNIT 1

~~Chapter 1 Final Review~~

1.) $y = -2\sin(4x+\pi)$

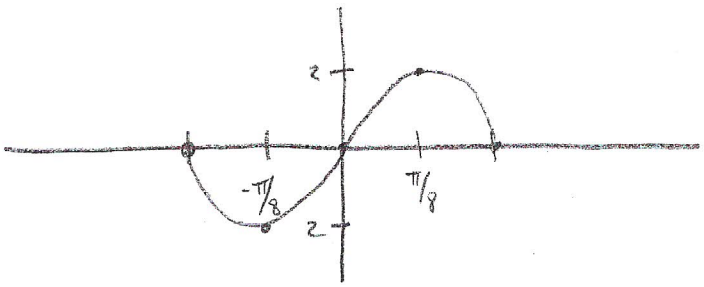
$y = -2\sin(4(x+\pi/4))$

amp = 2

period = $2\pi/4 = \pi/2 = 4\pi/8$

left $\pi/4$

CPD = $\pi/8$



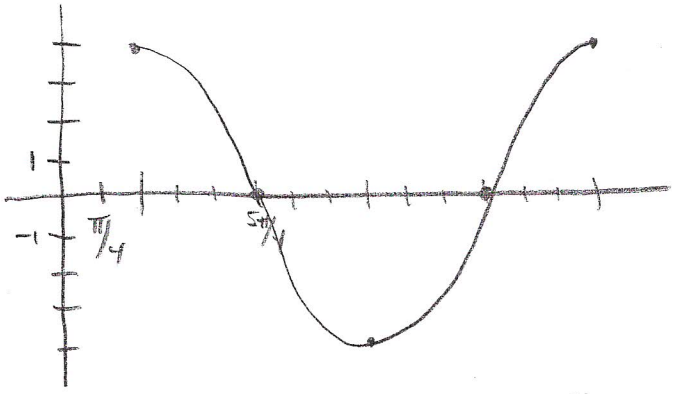
2.) $y = 4\cos(2/3(x-\pi/2))$

period = $2\pi/2/3 = 3\pi$

CPD = $3\pi/4$

right = $\pi/2 = 2\pi/4$

amp = 4

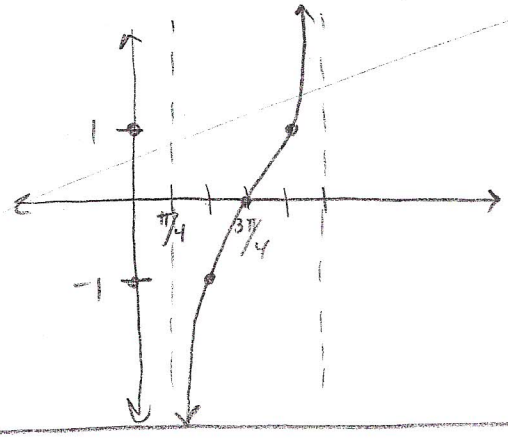


3.) $y = \tan(x-\pi/4)$

period = π

CPD = $\pi/4$

right $\pi/4$

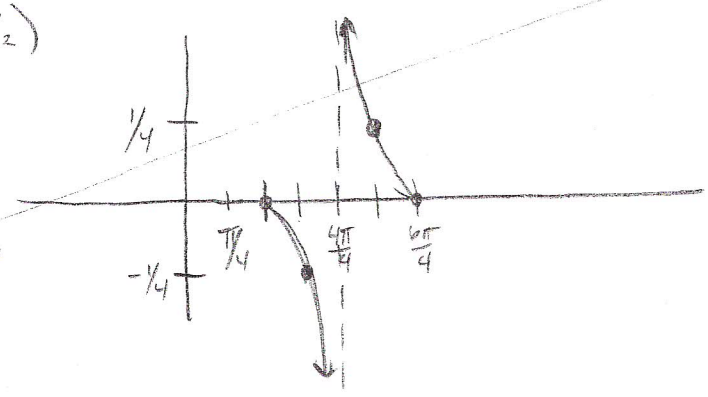


4.) $y = 1/4\cot(x-\pi/2)$

period = π

CPD = $\pi/4$

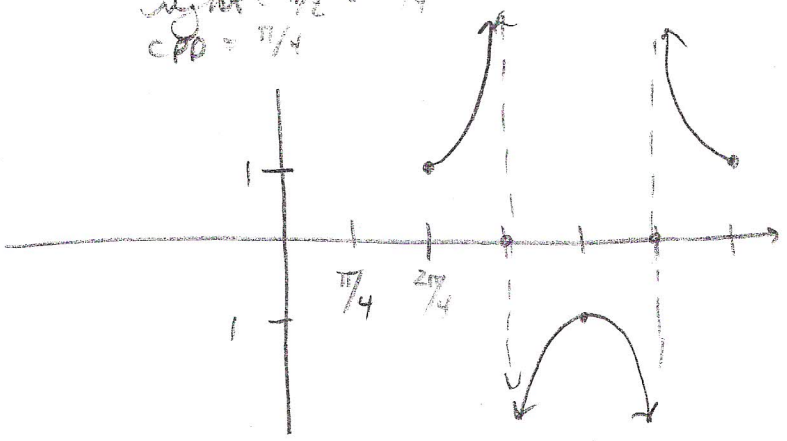
right $\pi/2 = 2\pi/4$



5) $y = \sec(2x - \pi) \rightarrow y = \cos(2(x - \pi/2))$

#3

amp: 1
period: π
shift: $\pi/2 = 2\pi/4$
CPD: $\pi/4$



6.) $V = .85 \sin\left(\frac{\pi t}{3}\right)$

$V = .85 \sin\left(\frac{1}{3}(\pi t)\right)$

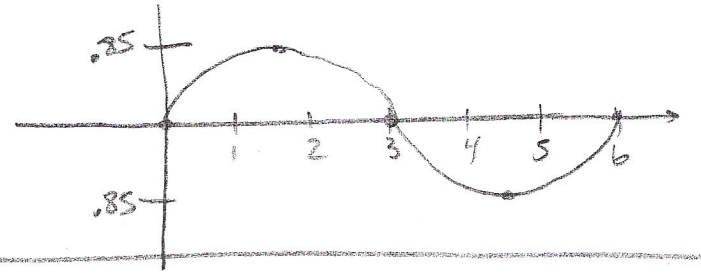
$V = .85 \sin\left(\frac{\pi}{3}(t)\right)$

a = 6 seconds.

b = 10

#4

$\frac{2\pi}{\pi/3} = 6$



#5 7.) $\frac{18 \text{ REV}}{\text{SEC}} \cdot \frac{30\pi \text{ IN}}{1 \text{ REV}} \cdot \frac{1 \text{ ft}}{12 \text{ IN}} \cdot \frac{1 \text{ mi}}{5280 \text{ ft}} \cdot \frac{3600 \text{ SEC}}{1 \text{ hr}}$ 1156.7 mph

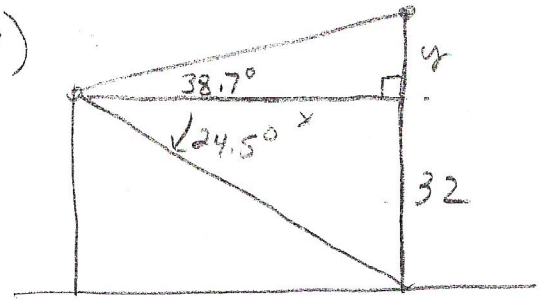
6 8.) $\frac{500 \text{ REV}}{\text{min}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} \cdot \frac{16\pi \text{ IN}}{1 \text{ REV}} \cdot \frac{1 \text{ ft}}{12 \text{ in}} \cdot \frac{1 \text{ mi}}{5280 \text{ ft}}$ 23.8 mph

7 9) $\frac{15 \text{ mi}}{\text{hr}} \cdot \frac{1 \text{ hr}}{3600 \text{ SEC}} \cdot \frac{1 \text{ REV}}{5\pi \text{ IN}} \cdot \frac{12 \text{ in}}{1 \text{ ft}} \cdot \frac{5280 \text{ ft}}{1 \text{ mi}}$ 16.8 rev/sec

8 10) $\frac{40 \text{ km}}{\text{hr}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} \cdot \frac{1 \text{ rev}}{21\pi \text{ cm}} \cdot \frac{100 \text{ cm}}{1 \text{ m}} \cdot \frac{1000 \text{ m}}{1 \text{ km}}$ 101.85 rev/min

9

11)



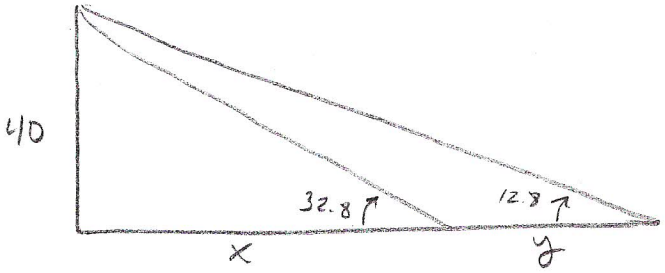
TAN 24.5 = $\frac{32}{x}$ Tan 38.7 = $\frac{y}{x}$

$x = 70.2$ $y = 56.24$

88.24 ft

10

12)



TAN 32.8 = $\frac{40}{x}$ TAN 12.8 = $\frac{40}{62.06+y}$

$x = 62.06$ $62.06 + y = 40 / \text{TAN } 12.8$

$y = 114$ ft

11

13.) a) $\frac{5200 \text{ REV}}{\text{MIN}} \cdot \frac{2\pi \text{ RAD}}{1 \text{ REV}} =$ 10400 π RAD/MIN

b.) $\frac{10400\pi \text{ RAD}}{\text{MIN}} \cdot \frac{7.25\pi \text{ IN}}{2\pi \text{ RAD}} \cdot \frac{1 \text{ FT}}{12 \text{ IN}} =$ 3141.66 π ft/MIN

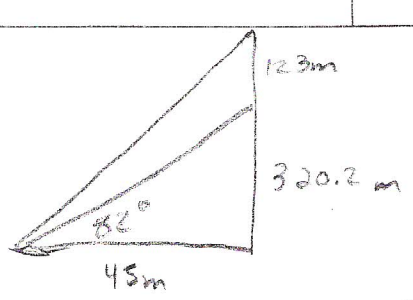
12

14) $\frac{7\pi}{12} \cdot \frac{180}{\pi} =$ 105 DEG

15.) $\frac{50}{1} \cdot \frac{\pi}{180} =$ $\frac{5\pi}{18}$ OR .8727

13

16)



$\tan 82 = \frac{x}{45}$

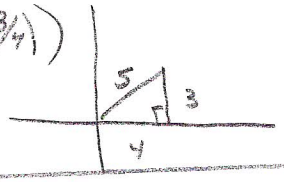
$x = 320.2\text{m}$

height of building = 443.2 m

distance to friend = 323.4m

14

17.) $\sin(\tan^{-1}(3/4))$

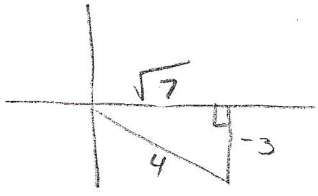


$= \frac{3}{5}$

15

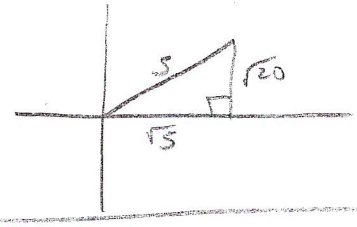
18.) $\tan(\sin^{-1}(-3/4)) = \frac{-3}{\sqrt{7}} = -\frac{3\sqrt{7}}{7}$

16



19.) $\sin(\cos^{-1}(\sqrt{5}/5)) = \frac{\sqrt{20}}{5}$

17

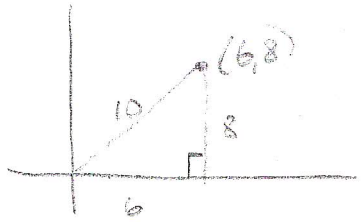


20) $y = 15\sin\left(\frac{\pi}{15}(x-2.5)\right)+5$

$y = -15\cos\left(\pi/15\,(x+5)\right)+5$

18

23.) (21)

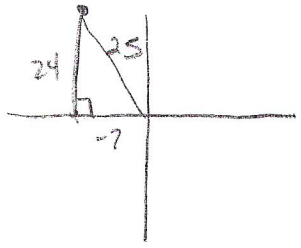


$\sin\theta = 4/5$ $\quad \csc\theta = 5/4$

$\cos\theta = 3/5$ $\quad \sec\theta = 5/3$

$\tan\theta = 4/3$ $\quad \cot\theta = 3/4$

24.) (22)

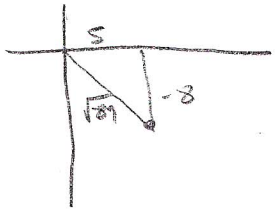


$\sin\theta = \frac{24}{25}$ $\quad \csc\theta = 25/24$

$\cos\theta = -7/25$ $\quad \sec\theta = 25/-7$

$\tan\theta = 24/-7$ $\quad \cot\theta = -7/24$

25.) (23)



$\sin\theta = -8/\sqrt{89}$ $\quad \csc\theta = -\sqrt{89}/8$

$\cos\theta = 5/\sqrt{89}$ $\quad \sec\theta = \sqrt{89}/5$

$\tan\theta = -8/5$ $\quad \cot\theta = -5/8$

24
26) -1.035 $\quad$ 25
27) 3.732 $\quad$ 26
28) 6.392 $\quad$ 27
29) $-.9986$

29
30) $.3350$ $\quad$ 29
31) 3.012 $\quad$ 30
32) 2.5388 $\quad$ 31
35) $-.3915$

32 34) $63.4°$ or $116.6°$

33 35) $112.4°$ or $247.5°$

34 36) $357.6°$ or $182.4°$

35 37) 6.02 or 3.398

36 38) $.975$ or 5.31

37 39) 1.49 or 4.633

40 42) $3\pi/4$ or $7\pi/4$

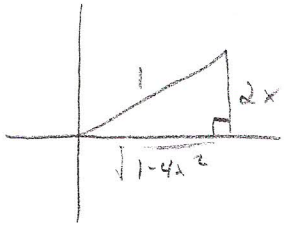
41 43) $5\pi/4$ or $7\pi/4$

44) $5\pi/6$ or $7\pi/6$

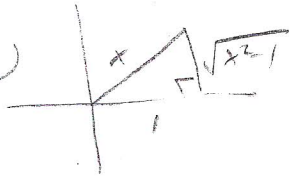
42

43 45) 0 or π

38
40) $\cos(\sin^{-1}(2x)) = \frac{\sqrt{1-4x^2}}{1}$



39
41) $\csc(\sec^{-1}(x)) =$



$\frac{x}{\sqrt{x^2-1}}$

~~Chapter 5A First Review~~ UNIT 2

1.) $\sin^2\theta = \dfrac{\sec^2\theta - 1}{\sec^2\theta}$

$= \dfrac{\tan^2\theta}{\sec^2\theta}$

$= \dfrac{\frac{\sin^2\theta}{\cos^2\theta}}{\frac{1}{\cos^2\theta}} = \boxed{\sin^2\theta}$ ✓

2.) $\csc\theta = \dfrac{\cot\theta\cos\theta}{1-\sin\theta} - 1$

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

$= \dfrac{\frac{\cos^2\theta}{\sin\theta} \cdot (1+\sin\theta)}{1-\sin\theta\,(1+\sin\theta)} - 1$

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

$= \dfrac{1+\sin\theta}{\sin\theta} - 1$

$= \dfrac{1}{\sin\theta} + 1 - 1$

$= \boxed{\csc\theta}$ ✓

3.) $\cos\theta - \dfrac{\cos\theta}{1-\tan\theta} = \dfrac{\sin\theta\cos\theta}{\sin\theta - \cos\theta}$

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

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

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

$\cos\theta - \dfrac{\cos^2\theta}{\cos\theta - \sin\theta}$

$\dfrac{\cos\theta(\sin\theta - \cos\theta)}{\sin\theta - \cos\theta} + \dfrac{\cos^2\theta}{\sin\theta - \cos\theta}$

$\boxed{\dfrac{\sin\theta\cos\theta}{\sin\theta - \cos\theta}}$ ✓

5) $1 + \sin 2\theta = (\sin\theta + \cos\theta)^2$

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

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

$= 1 + \sin 2\theta$ ✓

6.) $\sin^5\theta\cos^2\theta = \cos^2\theta\sin\theta - 2\cos^4\theta\sin\theta + \cos^6\theta\sin\theta$

$= \sin\theta(\cos^2\theta - 2\cos^4\theta + \cos^6\theta)$

$= \sin\theta\cos^2\theta(1 - 2\cos^2\theta + \cos^4\theta)$

$= \sin\theta\cos^2\theta(1-\cos^2\theta)(1-\cos^2\theta)$

$= \sin\theta\cos^2\theta(\sin^2\theta)(\sin^2\theta)$

$= \sin^5\theta\cos^2\theta$

7) $\sin\theta + \sqrt{2} = -\sin\theta$

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

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

$\theta = 5\pi/4, \ 7\pi/4$

8) $3\tan^2\theta - 1 = 0$

$\tan^2\theta = 1/3$

$\tan\theta = 1/\sqrt{3}$

$\theta = \pi/6, \ 5\pi/6$

9) $2\sin^2\theta - \sin\theta - 1 = 0$

$(2\sin\theta + 1)(\sin\theta - 1)$

$\sin\theta = -1/2 \quad \sin\theta = 1$

$\theta = 7\pi/6, \ 11\pi/6, \ \pi/2,$ ~~$3\pi/2$~~

10) $2(1-\cos^2\theta)+\cos\theta-3$

$2-2\cos^2\theta+\cos\theta-3=0$

$-2\cos^2\theta+\cos\theta-1=0$

$\frac{-1\pm\sqrt{1-4(-2)(-1)}}{-2}$

NO solution

11.) $\theta=105$

$\sin(45+60)=\sin45\cos60+\cos45\sin60$

$\frac{\sqrt{2}}{2}\cdot\frac{1}{2}+\frac{\sqrt{2}}{2}\cdot\frac{\sqrt{3}}{2}=\frac{\sqrt{2}}{4}+\frac{\sqrt{6}}{4}=\frac{\sqrt{2}+\sqrt{6}}{4}=\sin\theta$

$\cos(45+60)=\cos45\cdot\cos60-\sin45\sin60$

$\frac{\sqrt{2}}{2}\cdot\frac{1}{2}-\frac{\sqrt{2}}{2}\cdot\frac{\sqrt{3}}{2}=\frac{\sqrt{2}-\sqrt{6}}{4}=\cos\theta$

$\tan105=\frac{\frac{\sqrt{2}+\sqrt{6}}{4}}{\frac{\sqrt{2}-\sqrt{6}}{4}}=\frac{\sqrt{2}+\sqrt{6}}{\sqrt{2}-\sqrt{6}}=\tan\theta$ → still need to know sum + diff with TAN.

12.) $\theta=\frac{13\pi}{12}$

$\sin\left(\frac{3\pi}{12}+\frac{10\pi}{12}\right)=\sin\pi/4\cos5\pi/6+\cos\pi/4\sin5\pi/6$

$\frac{\sqrt{2}}{2}\cdot\frac{-\sqrt{3}}{2}+\frac{\sqrt{2}}{2}\cdot\frac{1}{2}=\frac{\sqrt{2}-\sqrt{6}}{4}$

$\cos\left(-\pi/4+5\pi/6\right)=\cos\pi/4\cos5\pi/6-\sin\pi/4\sin5\pi/6$

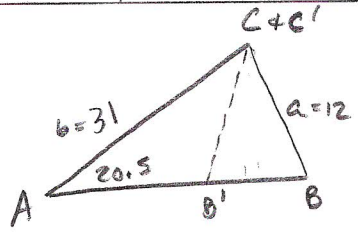
$\frac{\sqrt{2}}{2}\cdot\frac{-\sqrt{3}}{2}-\frac{\sqrt{2}}{2}\cdot\frac{1}{2}=\frac{-\sqrt{6}-\sqrt{2}}{4}$

$\tan13\pi/12=\frac{\sqrt{2}-\sqrt{6}}{-\sqrt{6}-\sqrt{2}}$

13) $a = 12$

$b = 31$

$\angle A = 20.5$



$\sin 20.5 = \frac{h}{31}$

$h = 10.9$

$\frac{\sin 20.5}{12} = \frac{\sin B}{31}$

$\angle B = 64.8°$ $\angle B' = 115.2°$ $b = 31$ $b' = 31$

$\angle C = 94.7°$ $\angle C' = 44.3°$ $c = 34.2$ $c' = 23.9$

$\angle A = 20.5°$ $\angle A' = 20.5°$ $a = 12$ $a' = 12$

$\frac{\sin 44.3}{c'} = \frac{\sin 115.2}{31}$ $\qquad$ $\frac{\sin 20.5}{12} = \frac{\sin 94.7}{c}$

$c' = 23.9$ $\qquad$ $c = 34.2$

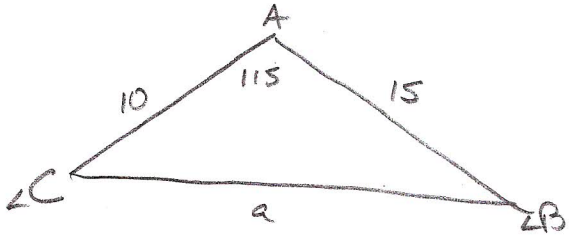
* Area 1 $= \frac{1}{2} 12 \cdot 31 \cdot \sin 94.7 = 185.4 \text{ un}^2$

* Area 2 $= \frac{1}{2} \cdot 12 \cdot 31 \cdot \sin 44.3 = 129.9 \text{ un}^2$

14.) $\angle A = 115$

$b = 15$

$c = 10$



$a^2 = 10^2 + 15^2 - 2 \cdot 15 \cdot 10 \cdot \cos 115$

$a = 21.3$

$\frac{\sin 115}{21.3} = \frac{\sin B}{15}$

Area $= \frac{1}{2} \cdot 10 \cdot 15 \cdot \sin 115 = 67.97 \text{ un}^2$

$B = 39.2$

$C = 25.8$

7.) $(1-\tan\theta)^2 = \sec^2\theta - 2\tan\theta$

$1 - 2\tan^2\theta + \tan^2\theta$

$1 + \tan^2\theta - 2\tan^2\theta$

$\sec^2 - 2\tan^2\theta$

8.) $\frac{\sin\theta}{1-\cos\theta} + \csc\theta + \cot\theta = \frac{2(1+\cos\theta)}{\sin\theta}$

$\frac{\sin\theta}{1-\cos\theta} + \frac{\csc\theta - \cot\theta}{1-\cos\theta} + \frac{\cot\theta - \frac{\cos^2\theta}{\sin\theta}}{1+\cos\theta} =$

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

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

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

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

$= \frac{2\sin\theta}{1-\cos\theta}\left(\frac{1+\cos\theta}{1+\cos\theta}\right)$ ✓ TRICK 2

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

$= \frac{2(1+\cos\theta)}{\sin\theta}$

9) $\sin(45-30) =$

$\sin 45 \cos 30 - \cos 45 \sin 30$

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

$\frac{\sqrt{6}-\sqrt{2}}{4}$

10.) $\cos\frac{15\pi}{12} = \cos\frac{5\pi}{4}$

$\cos(\pi/4 + \pi)$

$\cos\pi/4\cos\pi - \sin\pi/4\sin\pi$

$\frac{\sqrt{2}}{2} \cdot -1 - \frac{\sqrt{2}}{2} \cdot 0$

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

11) $\tan\left(\frac{5\pi}{12}\right) = \tan\left(\frac{2\pi}{12} + \frac{3\pi}{12}\right)$

$= \tan\left(\frac{\pi}{6} + \frac{\pi}{4}\right)$

$= \dfrac{\tan\frac{\pi}{6} + \tan\frac{\pi}{4}}{1 - \tan\frac{\pi}{6}\cdot\tan\frac{\pi}{4}}$

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

$\dfrac{\frac{2}{2\sqrt{3}} + \frac{\sqrt{6}}{2\sqrt{3}}}{\frac{2\sqrt{3}}{2\sqrt{3}} - \frac{\sqrt{2}}{2\sqrt{3}}}$

$\dfrac{2+\sqrt{6}}{2\sqrt{3}-\sqrt{2}}$

12) $\sin(2\theta) = \sin\theta$

$2\sin\theta\cos\theta - \sin\theta = 0$

$\sin\theta(2\cos\theta - 1) = 0$

$\sin\theta = 0$ $\quad 2\cos\theta - 1 = 0$

$\theta = 0, \pi$ $\quad \cos\theta = \frac{1}{2}$

$\theta = \frac{\pi}{6}, \frac{5\pi}{6}$

2MD #12) $\cos\theta + \cos 3\theta = 0$

$\cos\theta + \cos(2\theta + \theta) = 0$

$\cos\theta + \cos 2\theta\cos\theta - \sin 2\theta\sin\theta = 0$

$\cos\theta + (2\cos^2\theta - 1)\cos\theta - 2\sin\theta\cos\theta\sin\theta = 0$

$\cos\theta(1 + 2\cos^2\theta - 2\sin^2\theta) = 0$

$\cos\theta(1 + 2\cos^2\theta - 2(1 - \cos^2\theta)) = 0$

$\cos\theta(1 + 2\cos^2\theta - 2 + 2\cos^2\theta) = 0$

$\cos\theta(-1 + 4\cos^2\theta) = 0$

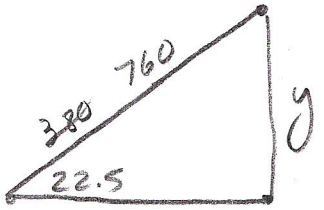
$\cos\theta = 0$ $\quad \cos^2\theta = \frac{1}{4}$

$\cos\theta = \pm\frac{1}{2}$

$\theta = \frac{\pi}{2}, \frac{3\pi}{2}$ $\quad \theta = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$

17) DO NOT DO THIS PROBLEM

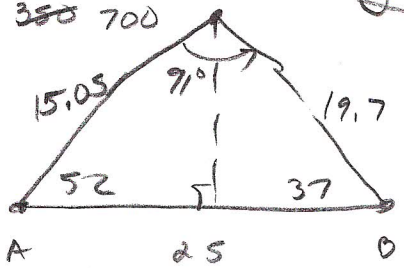
18.) #15



$y^2 = 760^2 + 700^2 - 2 \cdot 760 \cdot 700 \cos 22.5$

$y = 290.86$ mi

19.) #16



Tornado to Road = 11.9

A to tornado = 19.7 mi.

B to tornado = 15.05 mi

$\frac{\sin 52}{x} = \frac{\sin 91}{25} = \frac{\sin 37}{y}$

$x = 19.7$

$y = 15.05$

$15.05 \sin 52 = h$

$h = 11.9$

~~Unit 6A Review~~ UNIT 3

$v = \langle -2, 5 \rangle \quad w = \langle 3, 4 \rangle$

1.) $2v = \langle -4, 10 \rangle$

2.) $w - v = \langle 5, -1 \rangle$

3.) $v + 2w = \langle 4, 12 \rangle$

4.) $-6 + 20 = \boxed{14}$

5.) $\dfrac{-6 + 20}{\sqrt{29} \cdot \sqrt{25}} = \boxed{\dfrac{14}{5\sqrt{29}}}$

6.) $\langle 875\cos(-58), 875\sin(-58) \rangle + \langle w_1, w_2 \rangle = \langle 800\cos(-50), 800\sin(-50) \rangle$

$\langle 463.7, -742 \rangle + \langle w_1, w_2 \rangle = \langle 514.2, -612.8 \rangle$

$\langle w_1, w_2 \rangle = \langle 50.5, 129.2 \rangle$

$|w| = 138.7$

$\tan\theta = 129.2/50.5$

$\theta = 68.6°$ 21.3 Bearing

7.) $x = 70\cos 35t$

$y = 70\sin 35t - 16t^2 + 4$

a) 1.25 sec.
29.19

b) $70\cos 35 \cdot 2.61 = 149.65$

c) $7 = 70\sin 35t - 16t^2 + 4$

$0 = -16t^2 + 70\sin 35t - 3$

.08 sec and 2.43 sec

8) $x = \sqrt{t}$ $\quad y = -2t^2 + 5$

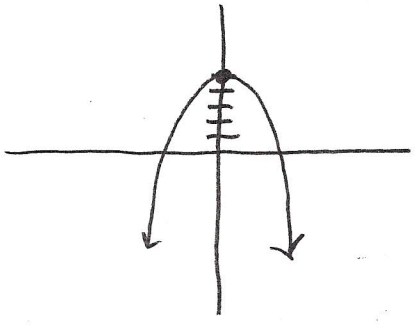
$t = x^2$

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

$y = -2x^4 + 5$

DOMAIN: $[0, \infty)$

RANGE: $[5, -\infty)$



9) $x = 3\cos\theta$ $\quad y = 3\sin\theta$

$\frac{x}{3} = \cos\theta$ $\quad \frac{y}{3} = \sin\theta$

$\frac{x^2}{9} = \cos^2\theta$ $\quad \frac{y^2}{9} = \sin^2\theta$

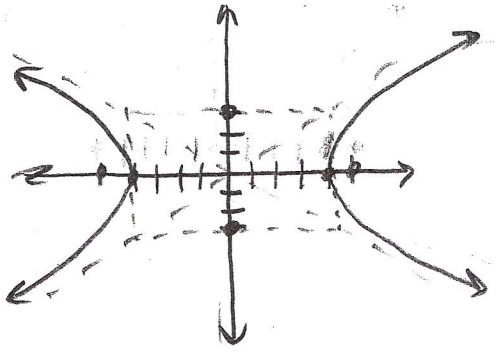
$\frac{x^2}{9} + \frac{y^2}{9} = 1$ → circle radius 3

10) $x = 4\sec\theta$ $\quad y = 3\tan\theta$

$\frac{x^2}{16} = \sec^2\theta$ $\quad \frac{y^2}{9} = \tan^2\theta$

$\frac{x^2}{16} - \frac{y^2}{9} = \sec^2\theta - \tan^2\theta$

$\frac{x^2}{16} - \frac{y^2}{9} = 1$



$c^2 = a^2 + b^2$

$c = 5$

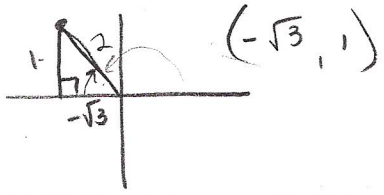
11) $(3\cos \pi/6, 3\sin \pi/6) = (2.6, 1.5)$

12) $r^2 = 4$

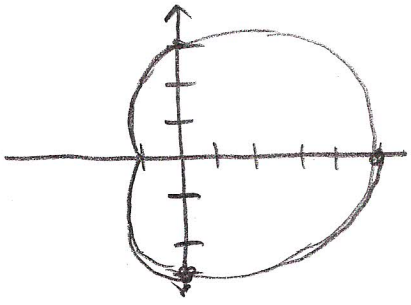
$r = 2$

$(2, 150°)$

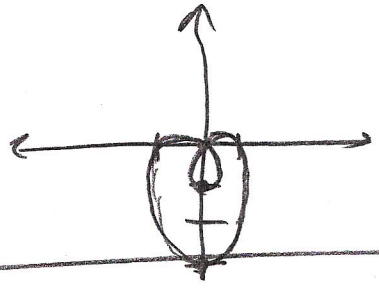
$\tan\theta = \frac{+}{-}\sqrt{3}$



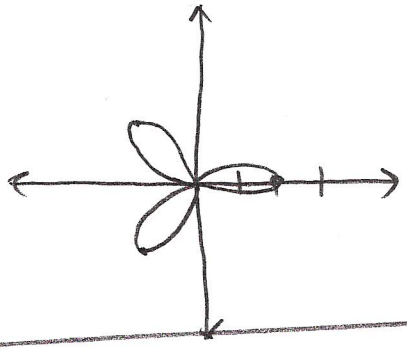
13) $r = 3 + 2\cos\theta$



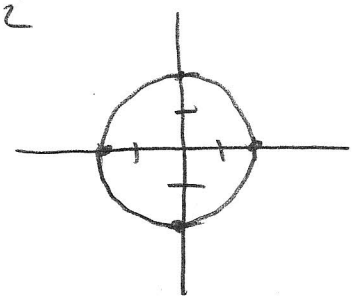
14) $r = 1 - 2\sin\theta$



15) $r = 2\cos 3\theta$



16) $r = 2$



17) $r = 2\cos 3\theta$ $\quad r = 2$

$2 = 2\cos 3\theta$

$1 = \cos(3\theta)$

$3\theta = 0$ or $3\theta = 360$

$\theta = 0$ $\quad \theta = 120$

$(2, 0)$

$(2, 120)$

$(2, -120)$

18) $y = 4$

$r\sin\theta = 4$

$r = 4\csc\theta$

19) $x^2 + y^2 = 9$

$r^2 = 9$

$r = 3$

20) $3x + 5y - 2 = 0$

$3r\cos\theta + 5r\sin\theta = 2$

$r = \frac{2}{3\cos\theta + 5\sin\theta}$

21) $(x+5)^2 + (y-2)^2 = 29$

$x^2 + 10x + 25 + y^2 - 4y + 4 = 29$

$r^2 + 10r\cos\theta - 4r\sin\theta = 0$

$r(r + 10\cos\theta - 4\sin\theta) = 0$

$r = 0 \;/\; r = 4\sin\theta - 10\cos\theta$

22) $r = 4\sin\theta$

$r^2 = 4r\sin\theta$

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

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

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

23) $r = 4$

$r^2 = 16$

$x^2 + y^2 = 16$

24) $r = 4\csc\theta$

$r\sin\theta = 4$

$y = 4$