Final (200 pts.) Name: KEY

Part I

True or False (2 pts. each)

Answer the following by circling TRUE or FALSE. If the answer is false you must explain why in the space provided for full credit.

1.) **T** **F** $\frac{\pi}{6} - \left(\frac{-11\pi}{6}\right) = \frac{12\pi}{6} = 2\pi$ ✓ $\alpha = \frac{\pi}{6}$ and $\beta = -\frac{11\pi}{6}$ are coterminal.

2.) **T** **F** linear velocity A car that travels around a circular race track at 260 mph is an example of angular velocity.

3.) **T** **F** $\frac{4\pi}{3} \cdot \frac{180}{\pi} = 240$ $\frac{4\pi}{3} < 240°$.

4.) **T** **F** $\left(-\frac{5}{13}\right)^2 + \left(\frac{12}{13}\right)^2 = \frac{25}{169} + \frac{144}{169} = \frac{169}{169} = 1$ ✓ The point $\left(-\frac{5}{13}, -\frac{12}{13}\right)$ lies on the unit circle.

Multiple Choice (3 pts. each)

5.) Convert 129.317° to degree-minute-second form. Round the to the nearest second.

(a) $129°1'5''$

(b) $129°1'23''$

(c) $129°19'37''$

(d) $129°19'1''$

$129(0.317 \times 60) = 129°(19.02)'$

$= 129°19'(0.2 \times 60)$

$= 129°19'1''$

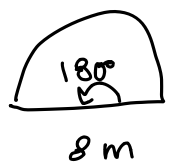
6.) Find the arc length of a semi-circle with diameter of 8 m.

(a) $s = 720$ m

(b) $s = 360$ m

(c) $s = 4\pi$ m

(d) $s = 2\pi$ m



$s = r\theta$ ← radians

$= 4 \cdot \pi$

7.) Find the missing length y if the square has an area of $841m^2$.

(a) 20 m

(b) 21 m

(c) 35 m

(d) 36 m

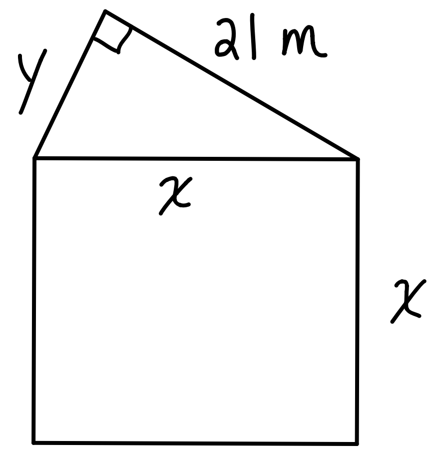
$x^2 = 841$

$\Rightarrow x = 29$

$29^2 - 21^2 = y^2$

$400 = y^2$

$20 = y$



8.) A wheel has a diameter of 10 cm. If the linear velocity of a point on the rim of a wheel is $V = 400$ cm/hr what is the angular velocity ω of the same point on the wheel?

(a) 40 rad/hr

(b) 60 rad/hr

(c) 80 rad/hr

(d) 100 rad/hr

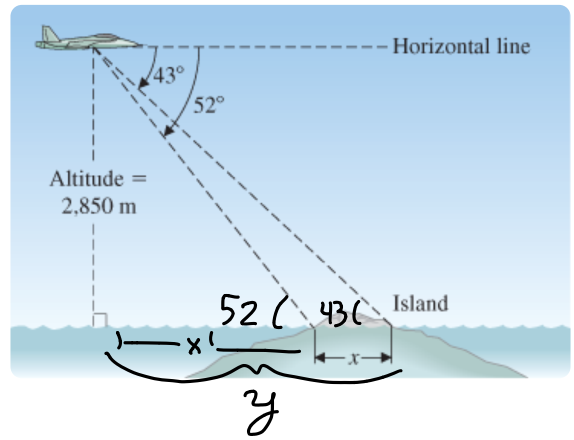
$L = r\omega$

$400 = 5\omega$

$80 = \omega$

Short Answer

9.) (6 pts.) Use the information in the figure to find the length x of the island.



$$\tan(43°) = \frac{2850}{y} \Rightarrow y = \frac{2850}{\tan(43°)}$$

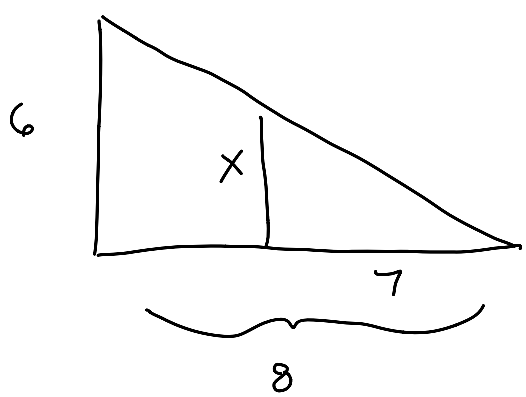
$$\Rightarrow y = 3056.25\,m$$

$$\tan(52°) = \frac{2850}{x'} \Rightarrow x' = \frac{2850}{\tan(52°)}$$

$$\Rightarrow x' = 2226.66\,m$$

$$x = y - x' = 3056.25 - 2226.66 = \boxed{829.59\,m}$$

10.) (6 pts.) Jack is 6 ft tall and casts an 8 ft shadow. At the same time, Jill casts a 7 ft shadow. How tall is Jill?



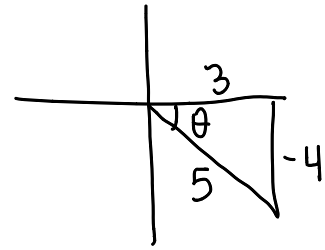
$$\frac{6}{8} = \frac{x}{7}$$

$$42 = 8x$$

$$\frac{42}{8} = x$$

$$\boxed{5.25 = x \text{ ft}}$$

11.) (6 pts.) Find the exact value of the following trig functions for the angle θ, without finding θ, given $\tan\theta = -\frac{4}{3}$ and θ is a quadrant IV angle.



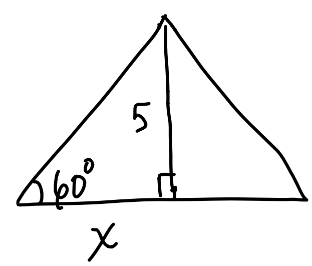
(a) $\sin\theta = \frac{-4}{5}$

(c) $\sec\theta = \frac{5}{3}$

(b) $\cos\theta = \frac{3}{5}$

(d) $\cot\theta = \frac{3}{-4}$

12.) (6 pts.) The altitude of an equilateral triangle is 5.0 cm. What is the perimeter the triangle? Round your answer to the nearest cm.



$\tan(60) = \frac{5}{x}$

$x\tan(60) = 5$

$x = \frac{5}{\tan(60)^\circ}$

$= 2.887$

$2x = 2(2.887)$

$= 5.774$

$\Rightarrow P = 5.774 + 5.774 + 5.774$

$\approx \boxed{17\text{ cm}}$

13.) (6 pts.) A circular sector has an area 100 cm^2 and a radius of 10 cm. Calculate the arc length of the sector to the nearest meter.

$$A = \frac{\theta}{2} r^2$$

$$100 = \frac{\theta}{2}(10)^2$$

$$200 = \theta(100)$$

$$2 = \theta$$

$$\Rightarrow \quad s = r\theta$$

$$= (10)(2)$$

$$= \boxed{20 \text{ cm}}$$

Part II

True or False (2 pts. each)

Answer the following by circling TRUE or FALSE. If the answer is false you must explain why in the space provided for full credit.

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

15.) **T** **F** $1+\cot^2 x = \csc^2 x$ $\quad\cot^2 x - 1 = \csc^2 x$

16.) **T** **F** $x=\frac{\pi}{2}+k\pi$ $\quad$ The graph of $y = \tan x$ has vertical asymptotes at $x = k\pi$ where k is an integer.

17.) **T** **F** $\frac{1}{\sin(-x)} = \frac{1}{-\sin x} = -\csc x$ $\quad\csc(-x) = -\csc(x)$

18.) **T** **F** amplitude DNE $\quad$ The amplitude of $y = -5\tan\left(x - \frac{\pi}{2}\right)$ is 5

Multiple Choice (3 pts. each)

19.) Which equation best describes the graph?

(a) $y = \sin x$

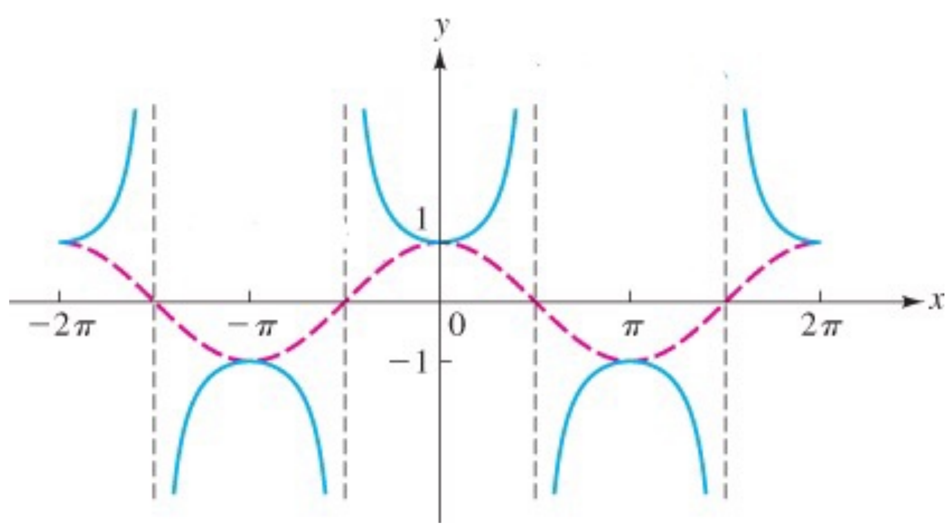
(b) $y = \cos x$

(c) $y = \tan x$

(d) $y = \csc x$

(e) $y = \sec x$

(f) $y = \cot x$



20.) Find the Max and Min of $y = -5 + 2\cos\left(\frac{\pi}{4}x + 1\right)$

(a) Max = -3; Min = -7

(b) Max = -7; Min = 3

(c) Max = -10; Min = 10

(d) Max = -12 ; Min = -8

$-1 \le \cos x \le 1$

$-1 \le \cos\left(\frac{\pi}{4}x+1\right) \le 1$

$-2 \le 2\cos\left(\frac{\pi}{4}x+1\right) \le 2$

$-7 \le -5+2\cos\left(\frac{\pi}{4}x+1\right) \le -3$

21.) Simplify completely: $\sec\left(\frac{\pi}{2} - x\right)$

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

(a) $\sin x$

(b) $\cos x$

(c) $\tan x$

(d) $\csc x$

(e) $\sec x$

(f) $\cot x$

22.) Simplify completely: $\frac{\tan x}{\sec^2 x - 1}$

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

$\tan^2 x + 1 = \sec^2 x$

$\Rightarrow \tan^2 x = \sec^2 x - 1$

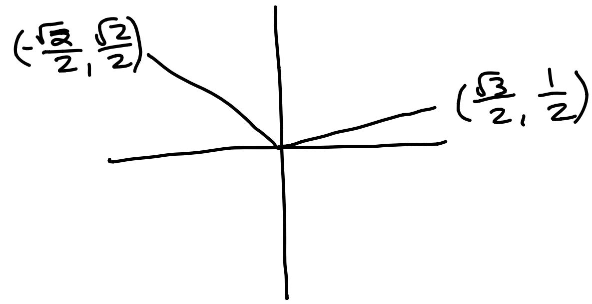
(a) $\tan x$

(b) $\cot x$

(c) $\sin x$

(d) $\sin x \tan x$

$\frac{\tan x}{\sec^2 x - 1} = \frac{\tan x}{\tan^2 x} = \frac{1}{\tan x} = \cot x$



Short Answer

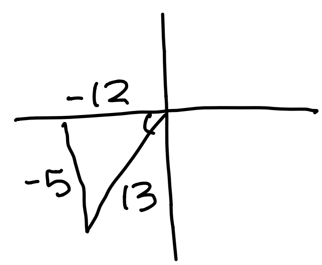
23.) (6 pts.) Find the <u>exact</u> value of $\cos(165°)$

$$\cos(135° + 30°) = \cos(135°)\cos(30°) - \sin(135°)\sin(30°)$$
$$= \left(-\frac{\sqrt{2}}{2}\right)\left(\frac{\sqrt{3}}{2}\right) - \left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{2}\right)$$
$$= -\frac{\sqrt{6}}{4} - \frac{\sqrt{2}}{4}$$
$$= \boxed{\frac{-\sqrt{6} - \sqrt{2}}{4}}$$
$$\approx -0.9659$$

24.) (6 pts.) Find the <u>exact</u> value of $\cos(2x)$ and $\tan\left(\frac{x}{2}\right)$ if $\tan x = \frac{5}{12}$ with $180° < x < 270°$.

$$\cos(2x) = 1 - 2\sin^2 x$$
$$= 1 - 2\left(\frac{-5}{13}\right)^2$$
$$= 1 - 2\left(\frac{25}{169}\right)$$
$$= 1 - \frac{50}{169}$$
$$= \frac{169}{169} - \frac{50}{169}$$
$$= \boxed{\frac{119}{169}}$$
$$\approx 0.704$$

$$\tan\left(\frac{x}{2}\right) = \frac{\sin x}{1 + \cos x}$$
$$= \frac{\left(\frac{-5}{13}\right)}{1 + \left(\frac{-12}{13}\right)}$$
$$= \frac{\left(\frac{-5}{13}\right)}{\left(\frac{1}{13}\right)}$$
$$= \frac{-5}{\cancel{13}} \cdot \frac{\cancel{13}}{1}$$
$$= \boxed{-5}$$



25.) (6 pts.) Find the period, phase shift, and vertical asymptotes of $y = 3\tan\left(\frac{\pi}{2}x + \frac{\pi}{4}\right)$

period: $\pi/B = \pi/(\pi/2) = \pi \cdot \frac{2}{\pi} = \boxed{2}$

phase shift: $-C/B = \frac{(-\pi/4)}{(\pi/2)} = \frac{-\pi}{4} \cdot \frac{2}{\pi} = \boxed{-\frac{1}{2}}$

$\frac{\pi}{2}x + \frac{\pi}{4} = -\frac{\pi}{2}$

$\frac{\pi}{2}x = -\frac{\pi}{2} - \frac{\pi}{4}$

$\frac{\pi}{2}x = -\frac{2\pi}{4} - \frac{\pi}{4}$

$\frac{\pi}{2}x = -\frac{3\pi}{4}$

$x = -\frac{3\cancel{\pi}}{\cancel{4}\,2} \cdot \frac{\cancel{2}\,1}{\cancel{\pi}}$

$x = -3/2$

$\frac{\pi}{2}x + \frac{\pi}{4} = \frac{\pi}{2}$

$\frac{\pi}{2}x = \frac{\pi}{2} - \frac{\pi}{4}$

$\frac{\pi}{2}x = \frac{2\pi}{4} - \frac{\pi}{4}$

$\frac{\pi}{2}x = \frac{\pi}{4}$

$x = \frac{\cancel{\pi}}{\cancel{4}\,2} \cdot \frac{\cancel{2}\,1}{\cancel{\pi}}$

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

$\Rightarrow$ $\boxed{\text{asymptotes at } 1/2 + 2k \text{ where } k \text{ is an integer}}$

26.) (6 pts.) Verify the identity below. (*Hint*: Use the sum to product identities to simplify the numerator and denominator)

$$\frac{\sin 2x + \sin 4x}{\cos 2x - \cos 4x} = \cot x$$

$$\frac{\sin 2x + \sin 4x}{\cos 2x - \cos 4x} = \frac{2\sin\left(\frac{2x+4x}{2}\right)\cos\left(\frac{2x-4x}{2}\right)}{-2\sin\left(\frac{2x+4x}{2}\right)\sin\left(\frac{2x-4x}{2}\right)}$$

$$= \frac{\cancel{2}\,1\,\cancel{\sin(3x)}\cos(-x)}{-\cancel{2}\,1\,\cancel{\sin(3x)}\sin(-x)}$$

$$= \frac{\cos(-x)}{-\sin(-x)}$$

$$= -\cot(-x)$$

$$= -(-\cot x)$$

$$= \boxed{\cot x}$$

27.) (6 pts.) Graph at least <u>one</u> period of $y = 5\cos(2x - \pi)$ by finding the amplitude, phase shift, and period.

amplitude $= 5$

phase shift $= -C/B = -(-\pi)/2 = \pi/2$

period $= 2\pi/B = 2\pi/2 = \pi$

$2x - \pi = 0$

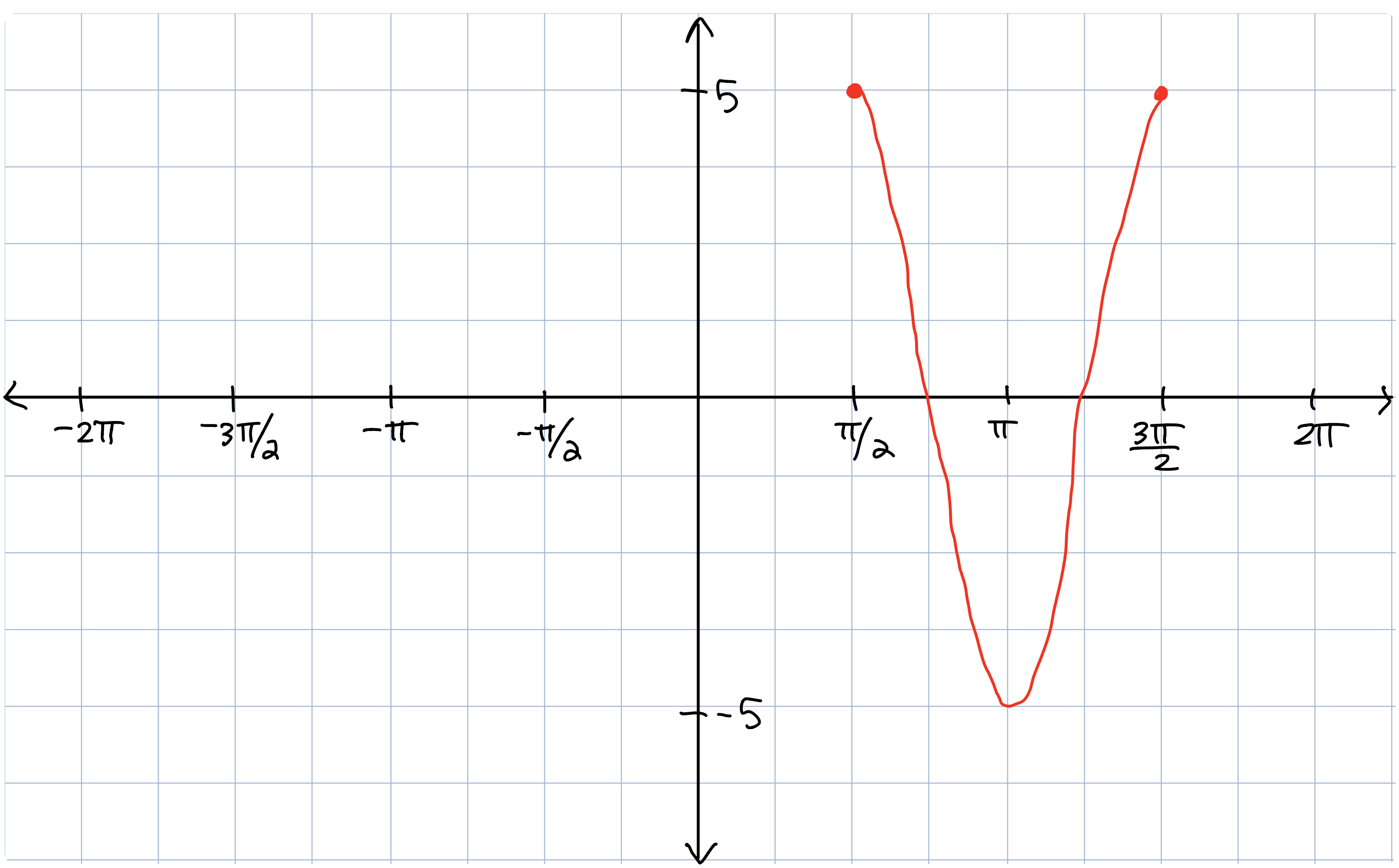
$2x = \pi$

$x = \frac{\pi}{2}$

$2x - \pi = 2\pi$

$2x = 3\pi$

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



Part III

True or False (2 pts. each)

Answer the following by circling TRUE or FALSE. If the answer is false you must explain why in the space provided for full credit.

29.) **T** **F** $(3)(3)+(-8)(8) \neq 0$ The vectors $\mathbf{u} = \langle 3, -8 \rangle$ and $\mathbf{v} = \langle 3, 8 \rangle$ are orthogonal.

30.) **T** **F** $\cot^{-1} x = \tan^{-1}\left(\frac{1}{x}\right)$ $\cot^{-1} x = \dfrac{1}{\tan^{-1} x}$

31.) **T** **F** -3.145 not in domain of $\cos^{-1} x$ $\cos(\cos^{-1}(-3.145)) = -3.145$

32.) **T** **F** $A = \frac{1}{2}(\sqrt{3})\left(\frac{\sqrt{3}}{2}\right) = \frac{3}{4}$ A triangle with base $b = \sqrt{3}$ in and height $h = \dfrac{\sqrt{3}}{2}$ in has area $A = \dfrac{3}{4}$ square inches.

Multiple Choice (3 pts. each)

33.) Which of the following triangles can be solved using Law of Sines?

(a) $a = 6$ in, $b = 9$ in, $c = 13$ in X SSS

(b) $\alpha = 30°$, $\beta = 71°$, $\gamma = 79°$ X AAA

(c) $\alpha = 40°$, $\beta = 62°$, $c = 10$ in AAS

(d) $\alpha = 62°$, $\beta = 128°$, $b = 17$ cm AAS X $(62° + 128° > 180°)$

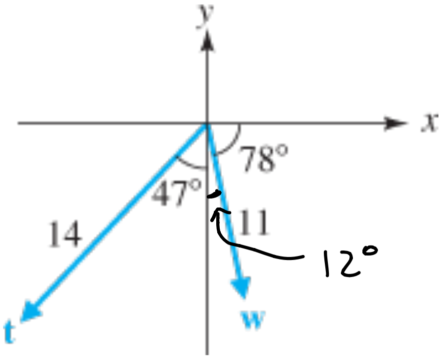
34.) Given the diagram below, find the $Comp_{\mathbf{t}}\mathbf{w}$, the component of $\mathbf{w}$ in the direction of $\mathbf{t}$.

(a) 5.67

(b) 7.21

(c) 7.50

(d) 9.55



$comp_t w = |w| \cos\theta$

$= 11\cos(90° - 78° + 47°)$

$= 11\cos(59°)$

≈ 5.665

35.) Let $A = (1, -2)$, $B = (1, 8)$, $\mathbf{v} = 3\mathbf{i} - 2\mathbf{j}$. Find $3\mathbf{u} - 4\mathbf{v}$ if $\mathbf{u} = \overrightarrow{AB}$.

(a) $< 8, -2 >$

(b) $< -12, -22 >$

(c) $< -12, 38 >$

(d) $< 8, -42 >$

$u = \langle 1-1, 8-(-2) \rangle = \langle 0, 10 \rangle$

$v = \langle 3, -2 \rangle$

$3u - 4v = \langle 0, 30 \rangle - \langle 12, -8 \rangle = \langle -12, 38 \rangle$

36.) Which equation best describes the graph?

(a) $\sin^{-1} x$

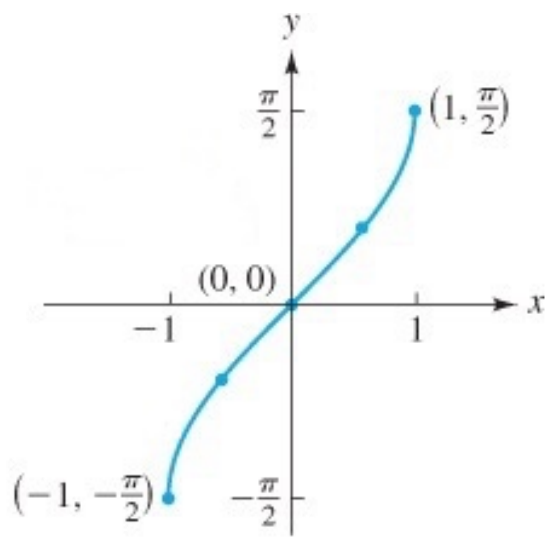
(b) $\cos^{-1} x$

(c) $\tan^{-1} x$

(d) $\csc^{-1} x$

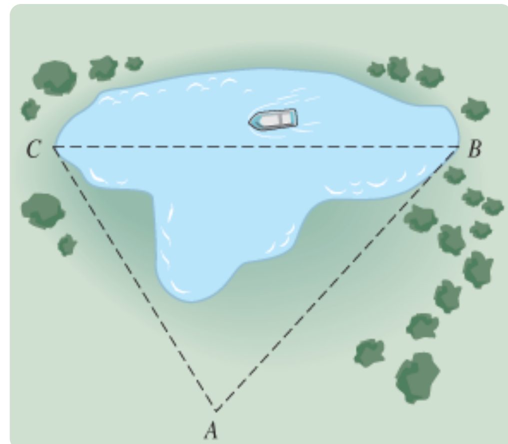
(e) $\sec^{-1} x$

(f) $\cot^{-1} x$



Short Answer

37.) (6 pts.) To estimate the length CB of the lake in the figure below, a surveyor measures AB and AC to be 100 m and 80 m respectively, and $\angle CAB$ to be 95°. Find CB, the approximate length of the lake.



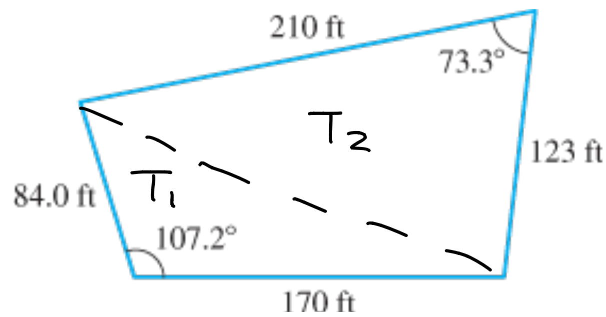
$$CB^2 = AB^2 + AC^2 - 2(AB)(AC)\cos(95^\circ)$$
$$= 100^2 + 80^2 - 2(100)(80)\cos(95^\circ)$$
$$= 16400 - 1600\cos(95^\circ)$$
$$= 17794.49188$$
$$\Rightarrow CB = \sqrt{17794.49188}$$
$$= \boxed{133.4 \text{ m}}$$

38.) (6 pts.) Find the area of a triangle with $a = 4.00$ in, $b = 6.00$ in, and $c = 8.00$ in.

$$s = \frac{4+6+8}{2} = \frac{18}{2} = 9$$

$$A = \sqrt{9(9-4)(9-6)(9-8)}$$
$$= \sqrt{9(5)(3)(1)}$$
$$= \sqrt{135}$$
$$= \sqrt{9}\sqrt{15}$$
$$= \boxed{3\sqrt{15} \text{ in}^2}$$
$$\approx 11.619$$

39.) (6 pts.) A four-sided plot of land, shown in the figure, occupies the cul-de-sac in a new development. The land in the rest of the development has sold for \$7.50 per square foot. Find the price of this plot to the nearest thousand dollars. (*Hint: Draw a diagonal that divides the plot into two triangles*)



$$A_{T_1} = \frac{1}{2}(84)(170)\sin(107.2^\circ)$$
$$= 6820.6875$$

$$A_{T_2} = \frac{1}{2}(210)(123)\sin(73.3^\circ)$$
$$= 12370.2775$$

$$A = A_{T_1} + A_{T_2} = 6820.6875 + 12370.2775 = 19190.96502$$

$$\Rightarrow P = (\$7.50)A = (7.50)(19190.96502) = 143{,}932.24$$
$$\approx \boxed{\$144{,}000}$$

40.) (6 pts.) Find the solutions to $\tan x = -2\sin x$ for all x.

$$\tan x = -2\sin x$$
$$\frac{\sin x}{\cos x} = -2\sin x$$
$$\sin x = -2\sin x\cos x$$
$$\sin x + 2\sin x\cos x = 0$$
$$\sin x(1 + 2\cos x) = 0$$

$$\Rightarrow \sin x = 0$$
$$x = 0, \pi$$
$$\Rightarrow x = 0 + \pi k$$
$$= \pi k$$

$$1 + 2\cos x = 0$$
$$1 = -2\cos x$$
$$\frac{1}{-2} = \cos x$$
$$x = \pi/3, 5\pi/3$$
$$\Rightarrow x = 2\pi/3 + 2k\pi,$$
$$4\pi/3 + 2k\pi$$

$$\boxed{x = \pi k, 2\pi/3 + 2k\pi, 4\pi/3 + 2k\pi}$$

41.) (6 pts.) Solve the triangle(s) with $\alpha = 26°$, $a = 11$ cm, and $b = 18$ cm.

$$\frac{\sin(26°)}{11} = \frac{\sin\beta}{18}$$

$$\Rightarrow 11\sin\beta = 18\sin(26°)$$

$$\Rightarrow \sin\beta = \frac{18\sin(26°)}{11}$$

$$\Rightarrow \beta = \sin^{-1}\left(\frac{18\sin(26°)}{11}\right)$$

$$= 45.83°$$

$$\gamma = 180° - (\alpha + \beta)$$

$$= 180° - (26° + 45.83°)$$

$$= 108.17°$$

$$\frac{\sin(26°)}{11} = \frac{\sin(108.17°)}{c}$$

$$\Rightarrow \sin(26°)c = 11\sin(108.17°)$$

$$\Rightarrow c = \frac{11\sin(108.17°)}{\sin(26°)}$$

$$\Rightarrow c = 23.84 \text{ cm}$$

$$\sin(45.83°) = \sin(180° - 45.83°)$$

$$= \sin(134.17°)$$

$$180 - (134.17 + 26°) = 19.83°$$

✓ we get two triangles

$\beta = 134.17°$ $\quad$ $\gamma = 19.83°$

$$\frac{\sin(26°)}{11} = \frac{\sin(19.83°)}{c}$$

$$\sin(26°)c = 11\sin(19.83°)$$

$$\Rightarrow c = \frac{11\sin(19.83°)}{\sin(26°)}$$

$$= 8.51 \text{ cm}$$

Triangle 1

$\alpha = 26°$ $\quad$ $a = 11$ cm

$\beta = 45.83°$ $\quad$ $b = 18$ cm

$\gamma = 108.17°$ $\quad$ $c = 23.84$ cm

Triangle 2

$\alpha = 26°$ $\quad$ $a = 11$ cm

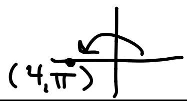
$\beta = 134.17°$ $\quad$ $b = 18$ cm

$\gamma = 19.83°$ $\quad$ $c = 8.51$ cm

Part IV

True or False (2 pts. each)

Answer the following by circling TRUE or FALSE. If the answer is false you must explain why in the space provided for full credit.

43.) T F 

The polar coordinates $(4, \pi)$ can be written as $(-4, 0)$ in rectangular coordinates.

44.) T F spiral — The graph $r = 2\theta$ is a circle.

45.) T F $\sqrt{(-2)^2+8^2} = \sqrt{68}$ — The modulus of $z = -2 + 8i$ is $\sqrt{68}$.

46.) T F $28\sqrt{2}\left[\cos\left(\frac{-\pi}{4}\right)+i\sin\left(\frac{-\pi}{4}\right)\right]$ — $28 - 28i = 28\sqrt{2}\left[\cos\left(-\frac{\pi}{3}\right) + i\sin\left(-\frac{\pi}{3}\right)\right]$ in exact trigonometric form.

$r^2 = 28^2 + 28^2 = 1568 \Rightarrow r = \sqrt{1568} = \sqrt{784}\sqrt{2} = 28\sqrt{2}$ ✓

$\tan\theta = \frac{-28}{28} = -1 \Rightarrow \theta = -\frac{\pi}{4}$ ✗

Multiple Choice (3 pts. each)

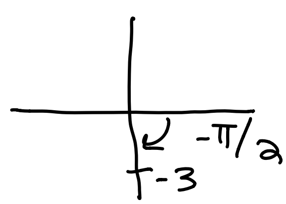
47.) Change the rectangular coordinates $(0, -3)$ to polar coordinates.

(a) $r = (3, \pi)$

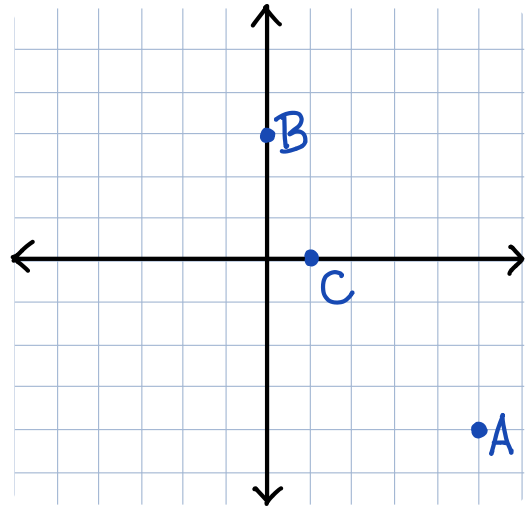
(b) $r = (-3, \pi)$

(c) $r = \left(3, \frac{\pi}{2}\right)$

(d) $r = \left(-3, \frac{\pi}{2}\right)$



48.) Which of the following describes the points A, B, and C in the complex plane below?



(a) $A = 5 - 4i$; $B = \cancel{-}3$; $C = -e^{\pi i}$

(b) $A = 5 - 4i$; $B = 3i$; $C = -e^{\pi i}$

(c) $A = 5 - 4i$; $B = 3i$; $C = e^{\pi i}$ $r=1$, $\theta = \pi$

(d) $A = \cancel{-}5 + 4i$; $B = -3$; $C = e^{\pi i}$

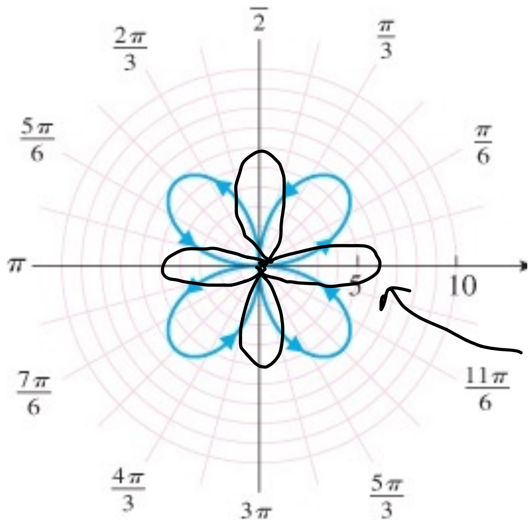
49.) Which of the following equations best describes the graph below?

(a) $r = 6\cos 2\theta$

(b) $r = 6\sin 2\theta$

(c) $r = 6\cos 4\theta$

(d) $r = 6\sin 4\theta$



$r = 6\cos 2\theta$

$r = a\cos 2\theta$ and $r = a\sin 2\theta$ are four-leaf roses

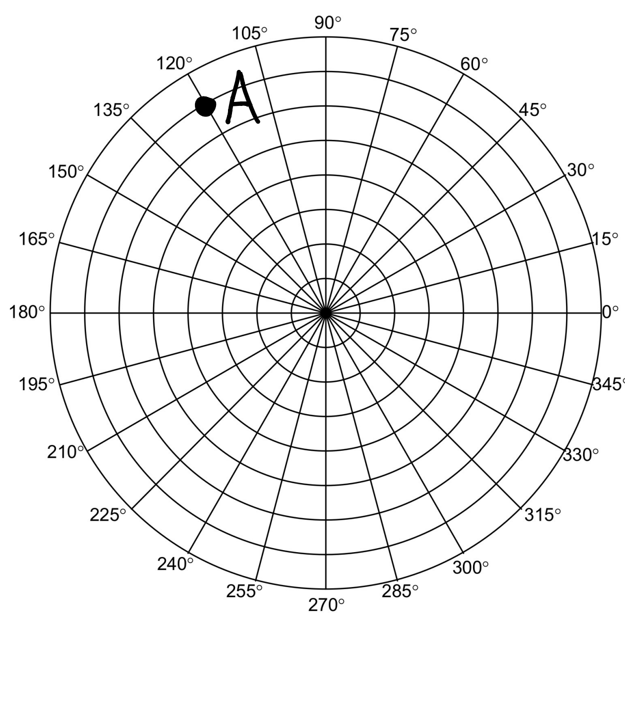
50.) The point A can be represented by all of the following polar coordinates below except:

(a) $A = \left(-7, -\frac{\pi}{3}\right)$

(b) $A = \left(7, -\frac{4\pi}{3}\right)$

(c) $A = \left(-7, \frac{2\pi}{3}\right)$

(d) $A = \left(7, \frac{2\pi}{3}\right)$



Short Answer

51.) (5 pts.) Write the polar equation $r^2\cos(2\theta) = 4$ in rectangular form.

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

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

$r^2 - 2(r\sin\theta)^2 = 4$

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

$x^2-y^2=4$

$\boxed{x^2-y^2-4=0}$

52.) (5 pts.) Write $(\sqrt{3}+i)^{13}$ in rectangular form.

① Write in polar form

$r^2 = (\sqrt{3})^2 + (1)^2 = 3+1 = 4$

$\Rightarrow r = \pm 2$

$\tan\theta = \frac{1}{\sqrt{3}} \Rightarrow \theta = 30°$

$\Rightarrow (\sqrt{3}+i)^{13} = (2e^{30°i})^{13}$

② Use De Moivre's Theorem

$(2e^{(30°i)})^{13} = 2^{13} e^{390°i}$

$= 8192e^{390°i}$

$= 8192e^{30°i}$

③ use Euler's Formula

$8192e^{30°i} = 8192[\cos(30°)+i\sin(30°)]$

$= 8192[\frac{\sqrt{3}}{2} + \frac{1}{2}i]$

$= \frac{8192\sqrt{3}}{2} + \frac{8192}{2}i$

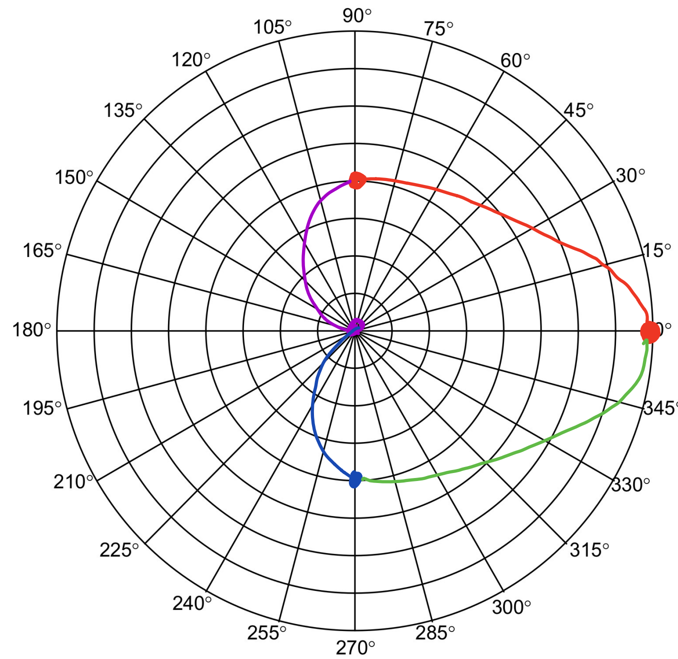
$= \boxed{4096\sqrt{3} + 4096i}$

$\approx 7094.48 + 4096i$

53.) (10 pts.) Graph the following:

(a) $r = 4 + 4\cos\theta$

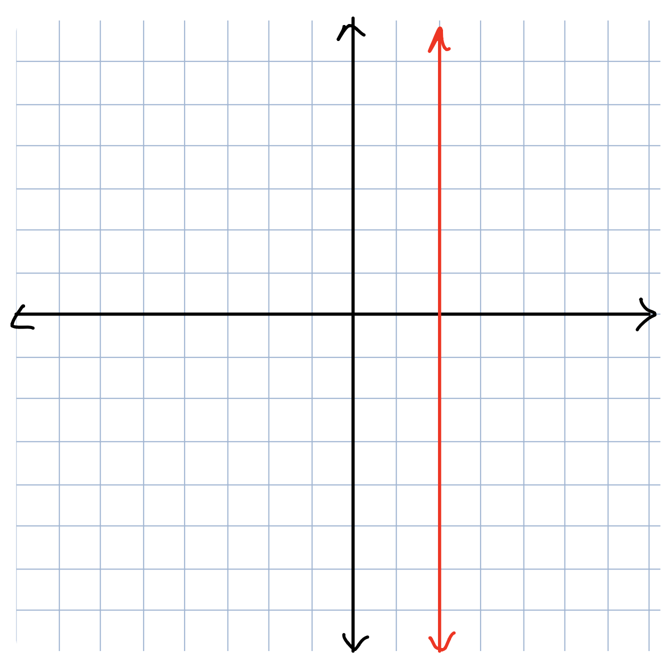
θ	$\cos\theta$	$4\cos\theta$	$4+4\cos\theta$
0 to $\pi/2$	1 to 0	4 to 0	8 to 4
$\pi/2$ to π	0 to -1	0 to -4	4 to 0
π to $3\pi/2$	-1 to 0	-4 to 0	0 to 4
$3\pi/2$ to 2π	0 to 1	0 to 4	4 to 8



(b) $r = \dfrac{2}{\cos\theta}$

$r\cos\theta = 2$

$x = 2$



54.) (5 pts.) Let $z_1 = 4e^{(25^\circ)i}$ and $z_2 = 8e^{(12^\circ)i}$. Find the following in polar form.

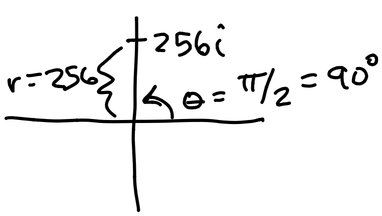
(a) $z_1 z_2$

$$z_1 z_2 = (4e^{25^\circ i})(8e^{12^\circ i})$$
$$= \boxed{32e^{37^\circ i}}$$

(b) $\dfrac{z_1}{z_2}$

$$\frac{z_1}{z_2} = \frac{4e^{25^\circ i}}{8e^{12^\circ i}}$$
$$= \boxed{\frac{1}{2}e^{13^\circ i}}$$

55.) (5 pts.) Solve the equation $x^4 - 256i = 0$ for all roots. Write each root in exact polar form.



$$x^4 - 256i = 0$$
$$x^4 = 256i$$
$$x^4 = 256e^{90^\circ i}$$

$$w_0 = 256^{1/4} e^{(90/4 + 0 \cdot 360/4)^\circ i} = \boxed{4e^{22.5^\circ i}}$$

$$w_1 = 256^{1/4} e^{(90/4 + 1 \cdot 360/4)^\circ i} = \boxed{4e^{112.5^\circ i}}$$

$$w_2 = 256^{1/4} e^{(90/4 + 2 \cdot 360/4)^\circ i} = \boxed{4e^{202.5^\circ i}}$$

$$w_3 = 256^{1/4} e^{(90/4 + 3 \cdot 360/4)^\circ i} = \boxed{4e^{292.5^\circ i}}$$