MATH 1700: TAKE HOME 04 (20 POINTS)

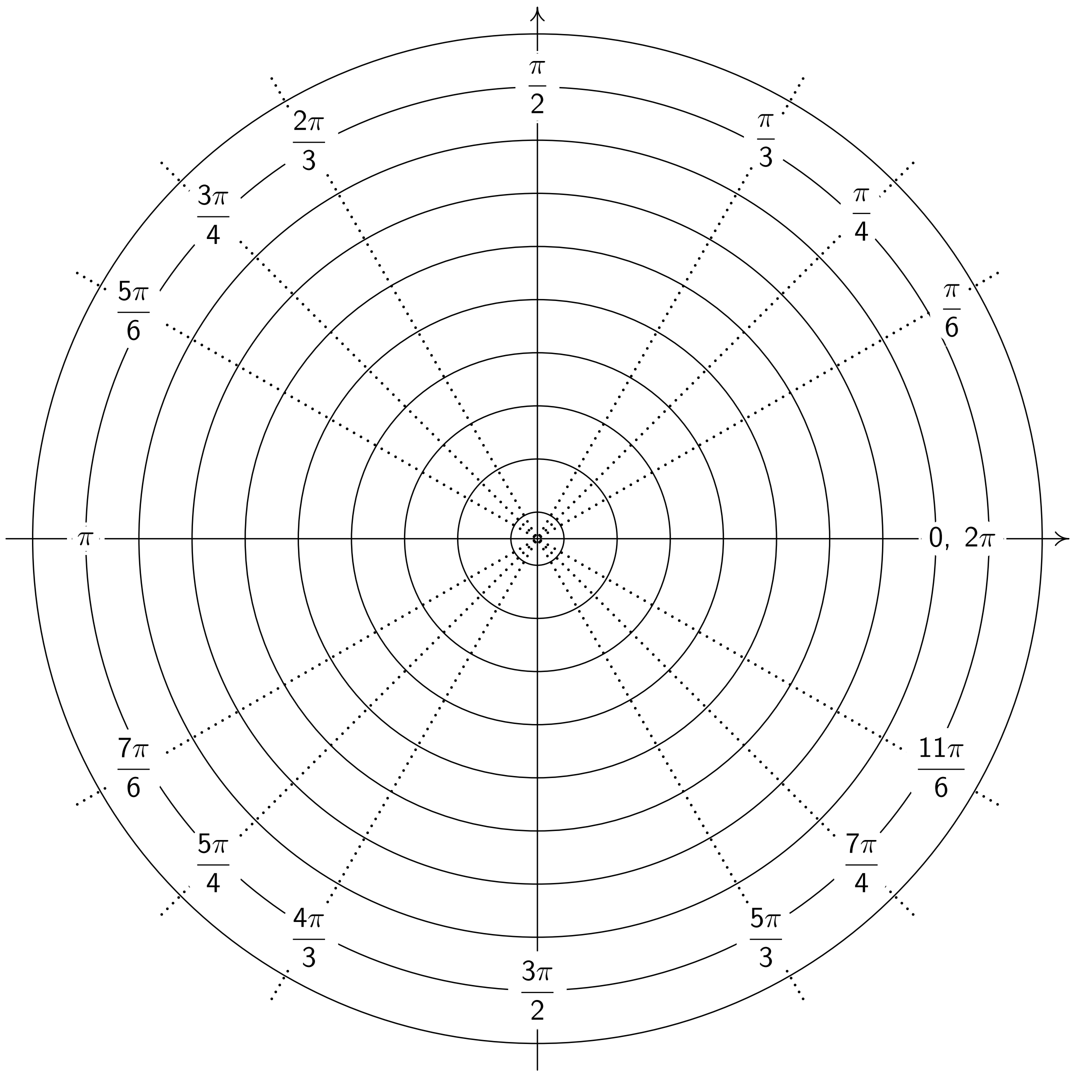
DUE THE DAY OF TEST 4 AT THE BEGINNING OF CLASS

NAME: ______________________________

DIRECTIONS: Make sure your work is neat and complete and uses the techniques demonstrated in class.

1. Plot **and label** the following points given in polar coordinates below:

$$\text{A: } \left(5, \frac{\pi}{6}\right), \text{ B: } \left(8, -\frac{\pi}{2}\right), \text{ C: } \left(-4, \frac{2\pi}{3}\right), \text{ D: } \left(-7, -\frac{5\pi}{6}\right), \text{ E: } (5, 117\pi)$$



2. Convert the following points from **polar** to *rectangular* coordinates:

(a) $\left(4, -\frac{2\pi}{3}\right)$

(b) $(117, \pi)$

(c) $(4\sqrt{2}, \arctan(7))$

3. Convert the following points from **rectangular** to *polar* coordinates. Choose $r > 0$ and $0 \leq \theta < 2\pi$.

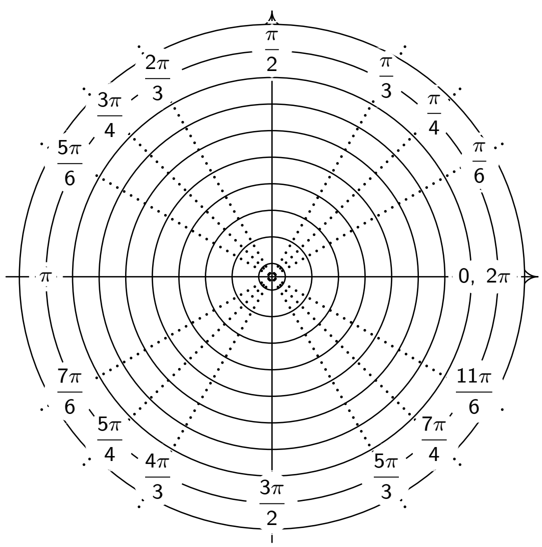
(a) $(2\sqrt{3}, -2)$

(b) $(0, -2)$

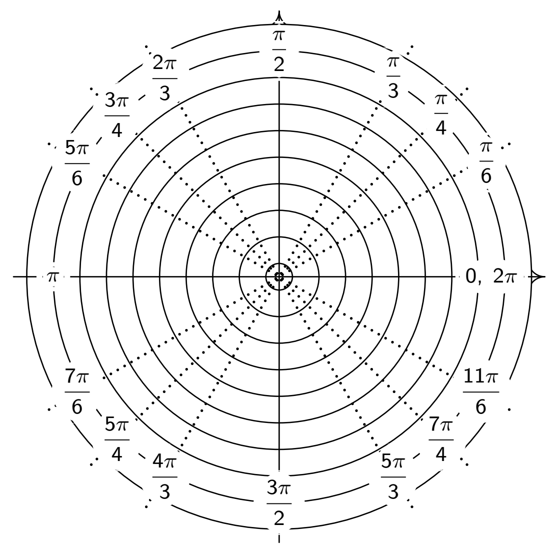
(c) $(-3, -4)$

4. Convert the following equation from **rectangular** to *polar* coordinates; solve for r: $x^2 + y^2 = 10y$

5. Graph and label $r = 5$ and $\theta = \dfrac{4\pi}{3}$ below:



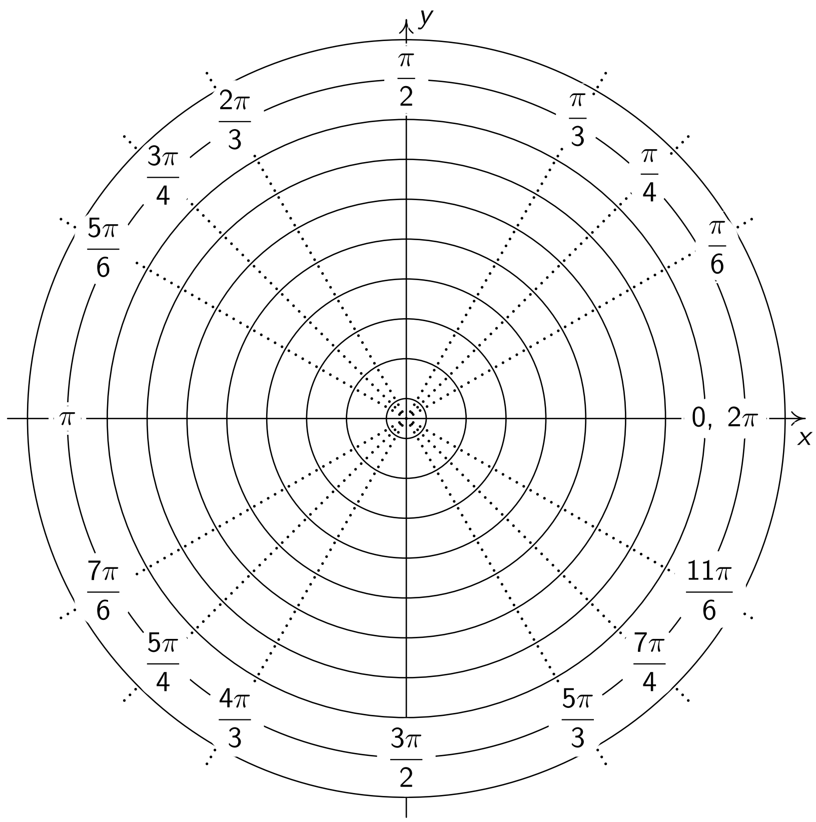
$r = 5$



$\theta = \dfrac{4\pi}{3}$

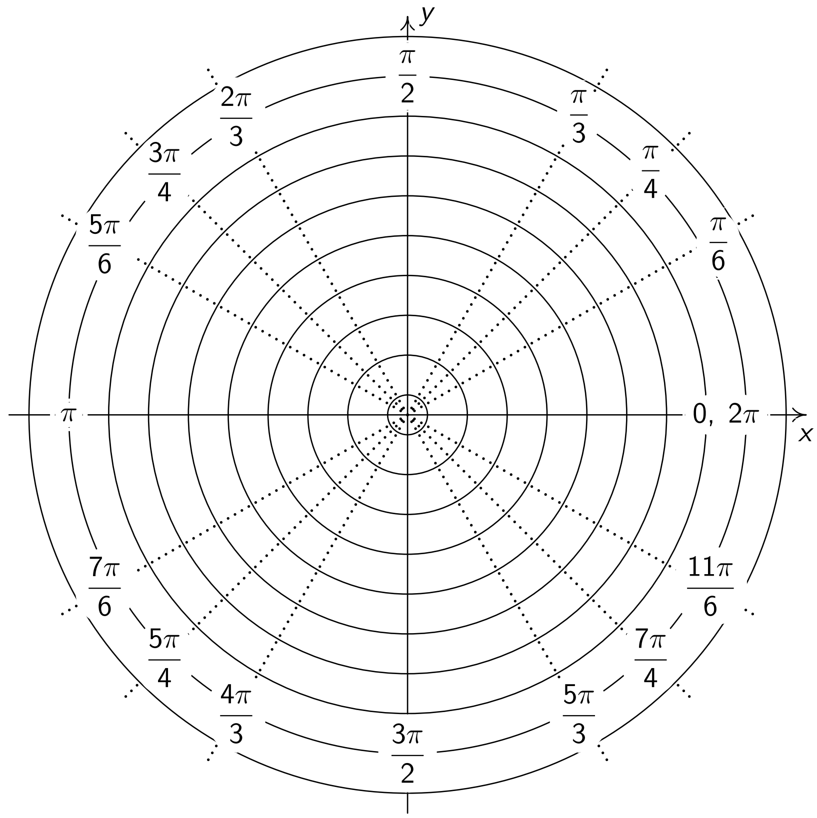
6. (a) Graph one cycle of $r = 6\cos(\theta) - 3$ on the θr-axes below. Find the θ-intercepts.

(b) Graph $r = 6\cos(\theta) - 3$ on the xy-axes below using your graph from part (a) as a guide.



(c) Which values of θ sweep out the 'inner loop' of your graph in part (b)?

7. Graph $r = 4\sin(\theta)$ and $r = 4 - 4\sin(\theta)$ below. Find the intersection points.



8. Let $z = 4 - 4i\sqrt{3}$.

(a) Plot z in the complex plane.

(b) Find $\text{Re}(z)$, $\text{Im}(z)$, and $|z|$.

(c) Write z in polar form. Find $\arg(z)$ and $\text{Arg}(z)$.

(d) Use DeMoivre's Theorem to find the following. Write your answer in standard (rectangular) form.

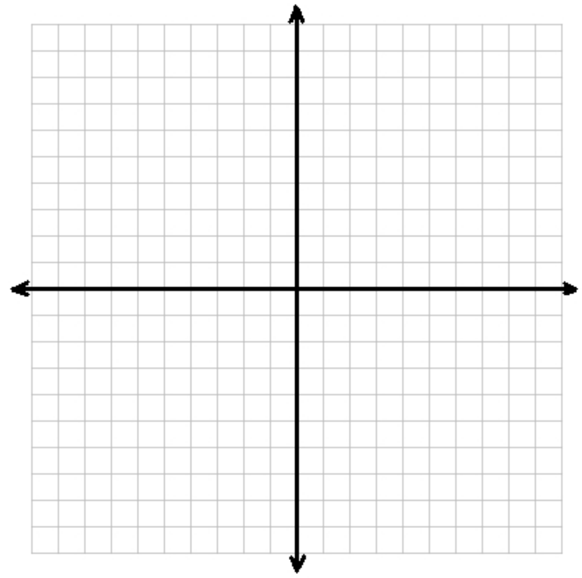
i. z^3

ii. Both square roots of z.

9. Consider the system of parametric equations: $\{x = 2 - 3\sin(t),\ y = 4\cos(t),\ 0 \le t \le \frac{3\pi}{2}$.

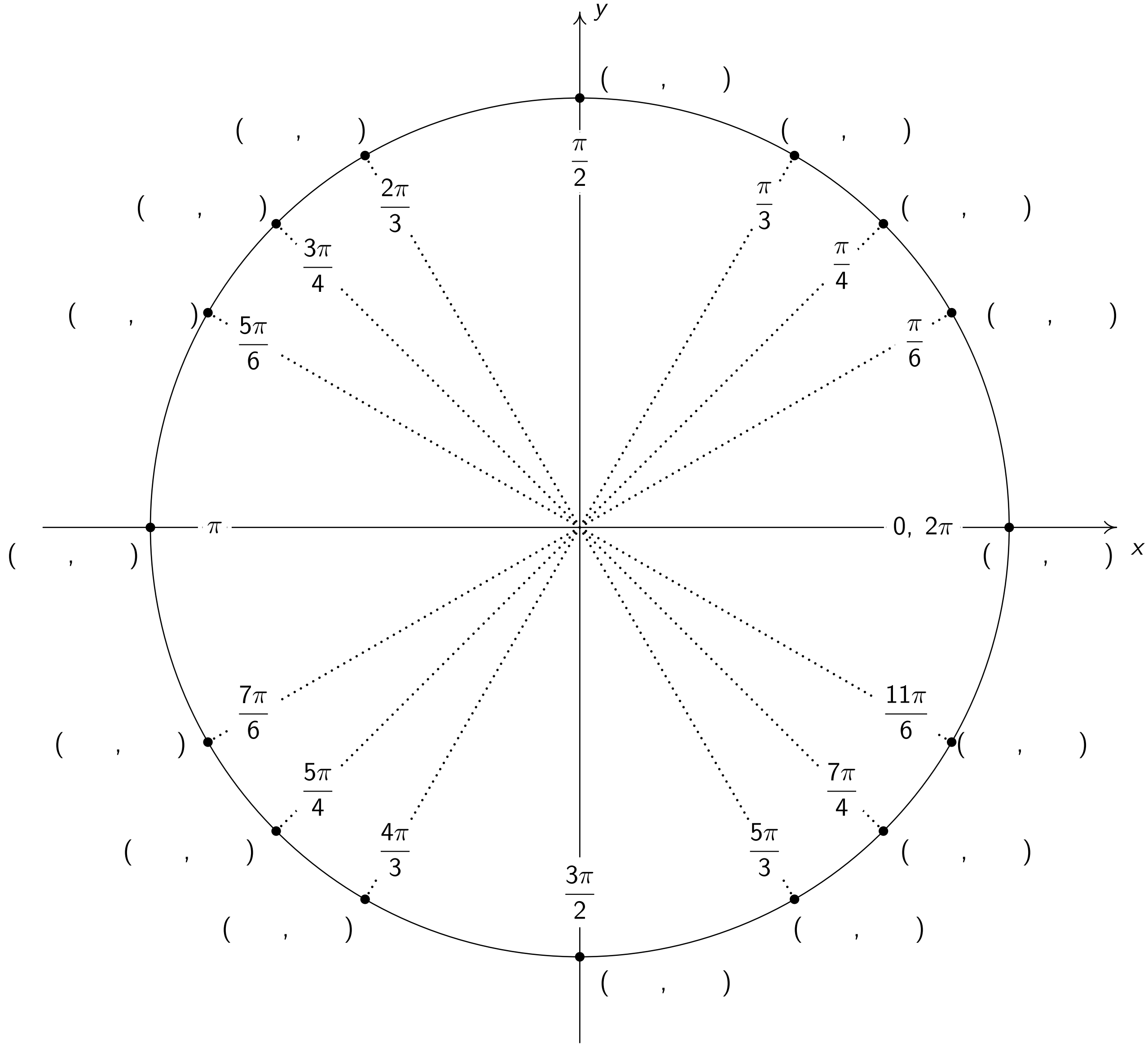
(a) Graph this system of equations. Include the orientation of the curve.

(b) Eliminate the parameter to obtain a single equation relating x and y to check your answer.



10. Find a parametric description of the line segment starting at $P(-3, 4)$ and ending at $Q(2, 1)$.

11. Fill in the indicated points on the Unit Circle below.



12. Suppose θ is a Quadrant III angle with $\tan(\theta) = 4$.

(a) Find a point on the terminal side of θ.

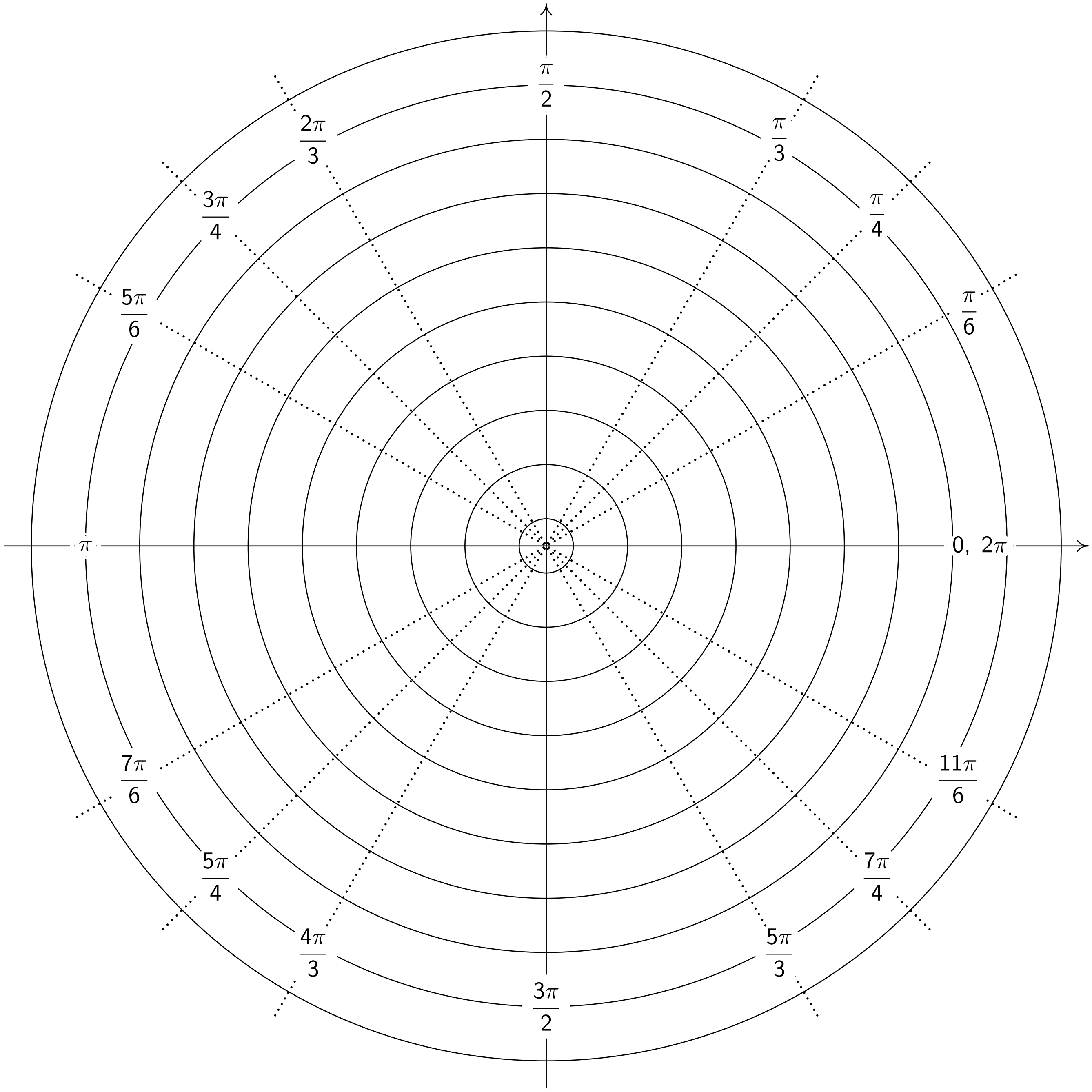
(b) Find the exact value of the six circular functions of θ.

(c) Find an angle coterminal with θ expressed in terms of $\arctan(4)$.

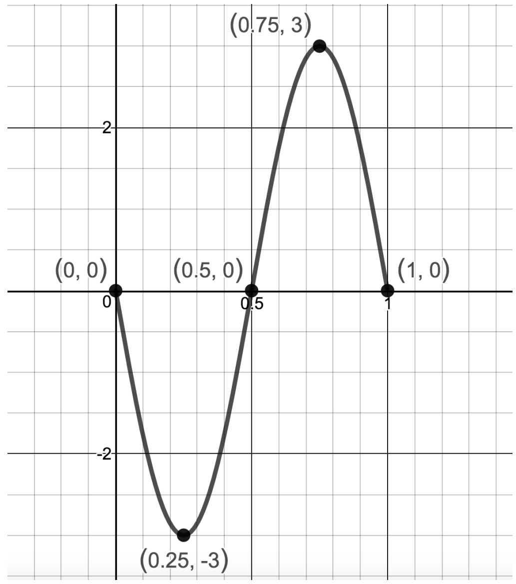
13. (a) Graph one cycle of $y = 4\cos\left(t - \frac{\pi}{6}\right) + 2$. Find the t-intercepts.

(b) Use your graph from part (a) to graph one cycle of $y = 4\sec\left(t - \frac{\pi}{6}\right) + 2$.

(c) Use your graph from part (a) to graph $r = 4\cos\left(\theta - \frac{\pi}{6}\right) + 2$. Label the tangents at the pole.



14. One cycle of a sinusoid is graphed below. Find a possible formula in the form $S(t) = A\sin(\omega t + \phi) + B$.



15. Solve the following equations in $[0, 2\pi)$. Exact answers only!

(a) $\sin\left(\frac{3\theta}{2}\right) = 1$

(b) $\tan^2(t) = 1 - \sec(t)$

16. Solve the following equations in $[0, 2\pi)$. Exact answers only!

(a) $\sec(\alpha) + \tan(\alpha) = \cos(\alpha)$

(b) $\cos(2x) = \cos(x)$

17. Verify the given identity:

(a) $$\frac{1}{1-\cos(x)}+\frac{1}{1+\cos(x)}=2\csc^2(x)$$

(b) Verify the identity: $\cos(A-B)-\cos(A+B)=2\sin(A)\sin(B)$

18. (a) Fill in the blanks: arcsin(x) is an ______ between ______ and ______ with ______ $=$ ______.

(b) Use part (a) to explain why the domain of $f(x) = \text{arcsin}(x)$ is $-1 \leq x \leq 1$.

(c) Use part (a) to explain why $\sin(\text{arcsin}(x)) = x$ for all x, $-1 \leq x \leq 1$.

(d) Explain why $\text{arcsin}\left(\sin\left(\frac{11\pi}{6}\right)\right) \neq \frac{11\pi}{6}$.

(e) Rewrite $\cos(\text{arcsin}(x))$ as an algebraic function of x. What are the restrictions on x?