NAME Key DATE PERIOD

Pre-Calculus Test Review **Vectors, Parametric and Polar Equations**

1. Write the pair of parametric equations $x = -2\cos\theta$ and $y = 4\sin\theta$ in rectangular form.

$x = -2\cos\theta$ $\quad y = 4\sin\theta$ $\quad \cos^2\theta + \sin^2\theta = 1$

$\frac{x}{-2} = \cos\theta$ $\quad \frac{y}{4} = \sin\theta$ $\quad \left(\frac{x}{-2}\right)^2 + \left(\frac{y}{4}\right)^2 = 1$

$\frac{x^2}{4} + \frac{y^2}{16} = 1$

2. Rewrite $y = t^2 + 9$ and $x = 3t - 1$ in rectangular form.

$x = 3t - 1$ $\quad y = t^2 + 9$

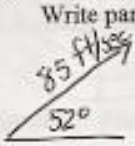
$\frac{x+1}{3} = t$ $\quad y = \left(\frac{x+1}{3}\right)^2 + 9$ Answer

3. Use the parameter $t = 3x - 4$ to determine the parametric equations that can represent $y = x^2 + 5$.

$t = 3x - 4$ $\quad y = x^2 + 5$

$\frac{t+4}{3} = x$ $\quad y = \left(\frac{t+4}{3}\right)^2 + 5$

4. Jose kicked a soccer ball with initial velocity of 85 feet per second at an angle of 52° with the ground. Write parametric equations to represent this situation.



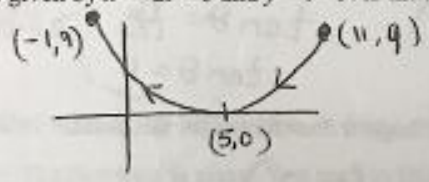
$x = 85\cos 52°\, t$

$y = -16t^2 + 85\sin 52°\, t$

Formula: $x = v_0\cos\theta\, t$

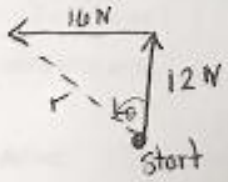
$y = -\frac{1}{2}(g)t^2 + v_0\sin\theta\, t + h_0$

5. Graph the curve given by $x = -2t + 5$ and $y = t^2$ over the interval $-3 \le t \le 3$?



t	x	y
-3	11	9
-2	9	4
-1	7	1
0	5	0
1	3	1
2	1	4
3	-1	9

6. A force $\mathbf{F}_1$ of 12 newtons pulls due north. A force $\mathbf{F}_2$ of 16 newtons pulls due west. Find the magnitude and direction of the resultant force.



$r^2 = 12^2 + 16^2$

$r^2 = 400$

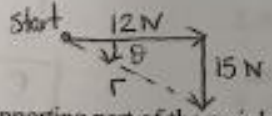
$r = 20\text{ N}$

$\tan^{-1}\left(\frac{16}{12}\right) = \theta$

$53.1° = \theta$

20 N at N53.1°W

7. A constant force of 12 newtons is being applied on an object in the direction of due east at the same time that a constant force of 15 newtons is being applied on the object in the direction of due south. What is the magnitude and direction of the force?



$r^2 = 12^2 + 15^2$

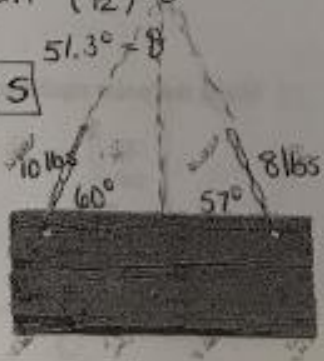
$r = 19.2\text{ N}$

$\tan^{-1}\left(\frac{15}{12}\right) = \theta$

$51.3° = \theta$

19.2 N at E51.3S

8. Each chain is supporting part of the weight of the wooden sign. If the chain on the left is attached at a 60° angle to the horizontal has a force of 10 pounds and the chain on the left is attached at a 57° angle to the horizontal has a force of 8 pounds, then how much does the wooden sign weigh?



$y_1 = 10\sin 60°$ $\quad y_2 = 8\sin 57°$

$y_1 = 8.7\text{ lbs}$ $\quad y_2 = 6.7\text{ lbs}$

$\text{Total} = y_1 + y_2 = 8.7 + 6.7 = 15.4\text{ lbs}$

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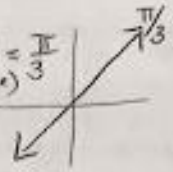
9. Graph the polar coordinates $(-2, \frac{\pi}{4})$ and $(3, -310°)$ on the given graph.

10. Graph $r = 4$ and $\theta = \frac{\pi}{3}$

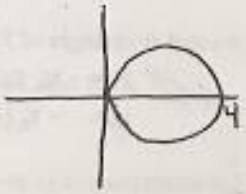
$r = 4$ (circle)

$\theta = \frac{\pi}{3}$ (line)



11. Graph $r = 2 + 2\sin\theta$.

12. Graph the polar equation $r = 4\cos\theta$.



Formulas

$\tan\theta = \frac{y}{x}$

$x^2 + y^2 = r^2$

13. Find polar coordinates for the point with rectangular coordinates $(\sqrt{2}, \sqrt{2})$ if $0 \le \theta \le 2\pi$ and $r \ge 0$.

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

$2 + 2 = r^2$

$4 = r^2$

$2 = r$

$(2, \frac{\pi}{4})$

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

$\tan\theta = 1$

$\tan^{-1}(1) = \theta$

$\frac{\pi}{4} = \theta$

14. Given the polar coordinates (2, 90°). Find rectangular coordinates for this point.

$x = r\cos\theta$

$y = r\sin\theta$

$x = 2\cos 90° = 0$

$y = 2\sin 90° = 2$

$(0, 2)$

15. Write the polar equation $r = 5$ in rectangular form.

$x^2 + y^2 = r^2$

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

16. Write the rectangular equation $x^2 + y^2 - 4x = 0$ in polar form.

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

$r^2 = 4(r\cos\theta)$

$\frac{r^2}{r} = \frac{4r\cos\theta}{r}$

$r = 4\cos\theta$

17. Write the polar equation $r^2 - 3r\sin\theta = 0$ in rectangular form.

$r^2 - 3r\sin\theta = 0$

$(x^2 + y^2) - 3(y) = 0$

$x^2 + y^2 - 3y = 0$