Precalculus Name:

Review 6.3-6.5

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Solve the problem.

1) For what values of θ ($0 \le \theta < 2\pi$) do maximum r-values occur on the graph of the polar equation $r = 1 + 4\cos 2\theta$? Note that a maximum r-value occurs at a point that is the maximum distance from the pole.

1) $\theta = 0, \pi$

$\theta = \frac{\pi}{8}, \frac{3\pi}{8}, \frac{5\pi}{8}, \frac{7\pi}{8}$

2) For what values of θ ($0 \le \theta < 2\pi$) do maximum r-values occur on the graph of the polar equation $r = 2\sin 4\theta$? Note that a maximum r-value occurs at a point that is the maximum distance from the pole.

2) $\cancel{\frac{9\pi}{8}, \frac{11\pi}{8}, \frac{13\pi}{8}}, \frac{15}{8}$

Determine if the graph is symmetric about the x-axis, the y-axis, or the origin.

3) $r = -3 + 5\sin\theta$ (verify using the test for symmetry)

3) ______

$\boxed{y\text{-axis}}$ $(r, \theta) \to (-r, -\theta)$

$-r = -3 + 5\sin(-\theta)$

$(-1)[-r] = [3 - 5\sin\theta](-1)$

$r = 3 + 5\sin\theta$ ✓

same graph $=$ $r = -3 + 5\sin\theta$

Find an equivalent equation in polar coordinates.

4) $x^2 + y^2 - 4x = 0$

4) ______

$r^2 - 4r\cos\theta$

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

$\boxed{r = 4\cos\theta}$ circle

5) $2x + 3y = 6$

5) ______

oblique line

$2r\cos\theta + 3r\sin\theta = 6$

$r(2\cos\theta + 3\sin\theta) = 6$

$r = \frac{6}{(2\cos\theta + 3\sin\theta)}$

Find an equivalent equation in rectangular coordinates.

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

6) $r = 6\cos\theta$

6) ______

$r^2 = 6r\cos\theta$

$x^2 + y^2 = 6x$

$(x^2 - 6x + 9) + y^2 = 0 + 9$

$\boxed{(x-3)^2 + y^2 = 9}$ circle center $(3,0)$; radius $= 3$

7) $r\sin\theta = 10$

7) ______

$\boxed{y = 10}$ horizontal line

Determine two pairs of polar coordinates for the point with $0^\circ \leq \theta < 360^\circ$.

8) $(4\sqrt{3}, 12)$

$\sqrt{r^2} = \sqrt{(4\sqrt{3})^2 + (12)^2} = \sqrt{192} = \sqrt{64 \cdot 3} = 8\sqrt{3}$

$\theta = \tan^{-1}\left(\frac{12}{4\sqrt{3}}\right) = 60^\circ$

8) $(8\sqrt{3}, 60^\circ)$ $(-8\sqrt{3}, 240^\circ)$

9) $(5, 5)$ $r = \sqrt{5^2+5^2} = \sqrt{50} = \sqrt{25 \cdot 2} = 5\sqrt{2}$

$\theta = \tan^{-1}\left(\frac{5}{5}\right) = 45^\circ$

9) $(5\sqrt{2}, 45^\circ)$ $(-5\sqrt{2}, 225^\circ)$

10) $(3, -3)$

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

$r = \sqrt{9 \cdot 2} = 3\sqrt{2}$

10) $(3\sqrt{2}, 315^\circ)$ $(-3\sqrt{2}, 135^\circ)$

Analyze the graph of the given polar curve. Include the following information: If possible, describe the shape of the graph (circle, rose curve, limacon, etc.), and state the domain, range, and maximum r-value of the graph. State whether the graph is continuous and whether it is bounded. Describe any symmetry that the graph has. Give the equations of any asymptotes or state that the graph has no asymptotes.

11) $r = 3 - 3 \cos \theta$ 11) ____________

- Limacon, cardioid
- Domain: all reals
- Range [0,6]
- Symmetry x-axis
- Continuous
- bounded
- r-max → 6
- no asymptotes

12) $r = -2 \cos 5\theta$ 12) ____________

- rose curve 5 petals
- Domain: all reals
- Range [-2,2]
- Symmetry x-axis
- continuous
- bounded
- r-max → 2
- No asymptotes

Eliminate the parameter.

13) $x = \sqrt{t}$, $y = 2t + 5$ 13) ________

$x^2 = t$ $y = 2x^2 + 5$

$t > 0$

14) $x = t - 5$, $y = \frac{6}{t + 7}$ 14) ________

$x + 5 = t$ $y = \frac{6}{x+5+7} \Rightarrow y = \frac{6}{x+12}$

Solve the problem using a graphing calculator.

15) Determine the approximate distance that a baseball travels if it is thrown with a velocity of 116 feet per second at an angle of 10° relative to level ground. 15) ________

$x = (116\cos 10°) \cdot t$
$y = -16t^2 + (116\sin 10°)t + 0$

≈ 145 feet

16) Determine whether a baseball hit 107 feet per second at an angle of 30° relative to level ground will clear a 10-foot wall 400 feet away. 16) ________

$x = (107\cos 30°)t$
$y = -16t^2 + (107\sin 30°)t$

No when the ball hits the ground it is about 310 feet away.

17) Determine which will travel farther: baseball x hit 97 feet per second at an angle of 35° relative to level ground or baseball y hit 127 feet per second at an angle of 30°. 17) ________

$x = 97\cos 35° t$
$y = -16t^2 + 97\sin 35° t$

≈ 275 feet

$x = 127\cos 30° t$
$y = -16t^2 + (127\sin 30°)t$

travels ≈ 434 feet

Baseball y