Worksheet 8.1—Polar Intro & Derivatives

Show all work. No calculator except unless specifically stated.

Short Answer

Convert the following equations to polar form.

1. \( y = 4 \)
2. \( 3x - 5y + 2 = 0 \)
3. \( x^2 + y^2 = 25 \)

Convert the following equations to rectangular form.

4. \( r = 3\sec \theta \)
5. \( r = 2\sin \theta \)
6. \( \theta = \frac{5\pi}{6} \)

For the following, find \( \frac{dy}{dx} \) for the given value of \( \theta \).

7. \( r = 2 + 3\sin \theta \), \( \theta = \frac{3\pi}{2} \)
8. \( r = 3(1 - \cos \theta) \), \( \theta = \frac{\pi}{2} \)
9. \( r = 4 \sin \theta \), \( \theta = \frac{\pi}{3} \)  

10. \( r = 2 \sin(3\theta) \), \( \theta = \frac{\pi}{4} \)

11. Find the point of horizontal and vertical tangency for \( r = 1 + \sin \theta \). Give your answers in polar form \((r, \theta)\).
Make a table (of values, not one at which to eat) and sketch the graph.

12. \( r = 2 - 2 \sin \theta \)  
13. \( r = 1 + 2 \cos \theta \)  
14. \( r = 4 \cos(2\theta) \)  
15. \( r^2 = 4 \sin(2\theta) \)

**Multiple Choice**

16. If \( a \neq 0 \) and \( \theta \neq 0 \), all of the following must represent the same point in polar coordinates *except* which ordered pair?

(A) \((a, \theta)\)  
(B) \((-a, -\theta)\)  
(C) \((-a, \theta - \pi)\)  
(D) \((-a, \theta + \pi)\)  
(E) \((a, \theta - 2\pi)\)
17. Which of the following gives the slope of the polar curve \( r = f(\theta) \) graphed in the \( xy \)-plane?

(A) \( \frac{dr}{d\theta} \)  (B) \( \frac{dy}{d\theta} \)  (C) \( \frac{dx}{d\theta} \)  (D) \( \frac{dy}{dx} \cdot \frac{d\theta}{d\theta} \)  (E) \( \frac{dy}{dx} \cdot \frac{dr}{d\theta} \)

18. Which of the following represents the graph of the polar curve \( r = 2 \sec \theta \)?

(A)  
(B)  
(C)  
(D)  
(E)  

\[ y \]
\[ x \]
\[ o \]
\[ 1 \]
\[ 2 \]