BC Cumulative 3

1. $x(t) = \cos t$ and $y(t) = \sin t$ are the parametric equations for
   a. A circle
   b. A square
   c. A parabola
   d. A hyperbola
2. If $x(t)$ and $y(t)$ are the parametric equations of a curve, the curve will have a horizontal tangent line at $t = c$ if
   a. $y'(c) = 0$ and $x'(c) \neq 0$
   b. $x'(c) = 0$ and $y'(c) \neq 0$
   c. $x(c) = 0$ and $y(c) = 0$
   d. $x(c) = 0$ and $x'(c) = 0$
3. To find the slope of the tangent line to a parametric curve at the point where $t = c$ you should
   a. Evaluate $y'(c)/x'(c)$
   b. Evaluate $x'(c)/y'(c)$
   c. Evaluate $y'(c)$
   d. Evaluate $x'(c)$
4. To determine concavity of a parametric curve at the point where $t = c$
   a. Evaluate $y''(c)/x''(c)$
   b. Evaluate $x''(c)/y''(c)$
   c. Evaluate $\dfrac{\frac{d}{dt}\left(\frac{dy}{dx}\right)}{\frac{dx}{dt}}$
   d. Evaluate $\dfrac{d}{dt}\left(\dfrac{dy}{dt}\right)$
5. If a parametric curve has a point where $x'(a) = 0$ and $y'(a) = 0$ then
   a. There is a horizontal tangent line at $t = a$
   b. There is a vertical tangent line at $t = a$
   c. There is no tangent lint at $t = a$
   d. The curve must cross itself
6. The distance traveled from $t = a$ to $t = b$ of a particle with position vector $\langle x(t), y(t)\rangle$ is given by
   a. $\displaystyle\int_a^b \sqrt{\frac{dx}{dt}^2(t) + \frac{dy}{dt}^2(t)}\, dt$
   b. $\displaystyle\int_a^b \sqrt{x^2(t) + y^2(t)}\, dt$
   c. $\displaystyle\int_a^b |x'2(t) + y'(t)|\, dt$
   d. $\sqrt{(x(t) - x(0))^2 + (y(t) - y(0))^2}$
7. The displacement of a particle moving in the plane over an interval of time
   a. Can be positive or negative
   b. Is the same as the distance traveled
   c. Is never less than the distance traveled

d. Depends on the shape of the path taken

8. If a particle in the first quadrant is accelerating towards the x axis then
   a. $\dfrac{dy}{dt} < 0$
   b. $\dfrac{dx}{dt} < 0$
   c. $\dfrac{d^2x}{dt^2} > 0$
   d. $\dfrac{d^2y}{dt^2} > 0$
9. Which of the following is not a polar-rectangular transformation equation?
   a. $\tan\theta = \dfrac{x}{y}$
   b. $x^2 + y^2 = r^2$
   c. $x = r\cos\theta$
   d. $y = r\sin\theta$
10. If n is a positive integer, the graph of $r = \sin(n\theta)$ always
    a. Has one intercept at $(0, 0)$
    b. Is a rose with n petals
    c. Is a rose with $2n$ petals
    d. Completes exactly one period of the graph over $0 \le \theta < 2\pi$
11. The graph of $r = a + b\sin(\theta)$
    a. Has an inner loop whenever $a < b$
    b. Has an inner loop whenever $a > b$
    c. Never intersects the x-axis
    d. Never intersects the y-axis
12. The area enclosed by a polar curve between $\theta = \alpha$ and $\theta = \beta$ is always
    a. Dependent on if the curve intersects itself in the interval $\alpha < \theta < \beta$
    b. $\int_a^b \frac{1}{2} r^2(\theta)\, d\theta$
    c. $\int_a^b r^2(\theta)\, d\theta$
    d. $\int_a^b r(\theta)\, d\theta$
13. If $\dfrac{dr}{d\theta} > 0$ at a point where $\theta = \alpha$ then
    a. The graph's radius is increasing at $\theta = \alpha$
    b. The graph's radius is decrasing at $\theta = \alpha$
    c. The tangent line to the graph $\theta = \alpha$ has a positive slope
    d. The tangent line to the graph at $\theta = \alpha$ has a negative slope
14. A logistic population graph $y = f(t)$ with a max population of L
    a. Has an asymptote at $y = L$
    b. Has a decreasing growth rate when $t > 0$
    c. Has an increasing growth rate when $t > 0$
    d. Can oscillate for certain initial conditions
15. The maximum growth rate for a logistic population with carrying capacity L
    a. Occurs when the population is $L/2$
    b. Depends on the initial conditions

c. Always occurs at $t = 0$
d. Can happen more than once during a given solution