BC Calculus '17-18 Name_____
Parametric/Polar Test

1. The velocity of a particle's motion is described by $\langle t^2 + t - 2,\ 2t^2 + 3t - 2 \rangle$. At $t = 1$, the particle's position is $(3, -5)$. $y(6) =$

a) 79.167

b) 74.167

c) 185.833

d) 180.833

e) 188.833

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2. A curve is described by the parametric equations $x = t^2 + 2t$ and $y = t^3 + t^2$. An equation of the line tangent to the curve at the point determined by $t = 1$ is

a) $2x - 3y = 0$ b) $4x - 5y = 2$ c) $4x - y = 10$

d) $5x - 4y = 7$ e) $5x - y = 13$

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3. Find the slope of the line tangent to $r = 2\theta + \cos\theta$ at $\theta = \frac{\pi}{2}$.

a) 0 b) 2 c) 3 d) $\frac{1}{\pi}$ e) $-\frac{1}{\pi}$

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4. The area of one loop of the graph of the polar equation $r = 2\sin(3\theta)$ is given by which of the following expressions?

a) $4\int_0^{\frac{\pi}{3}} \sin^2(3\theta)\, d\theta$ b) $2\int_0^{\frac{\pi}{3}} \sin(3\theta)\, d\theta$ c) $2\int_0^{\frac{\pi}{3}} \sin^2(3\theta)\, d\theta$

d) $2\int_0^{\frac{2\pi}{3}} \sin^2(3\theta)\, d\theta$ e) $2\int_0^{\frac{2\pi}{3}} \sin(3\theta)\, d\theta$

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5. A particle moves on a plane so that its position vector is $p(t)=\left\langle \frac{1}{3}t^3+\frac{1}{2}t^2-2t+7,\ \frac{2}{3}t^3+\frac{3}{2}t^2-2t+\pi^6 \right\rangle$ is at rest when

a) $t=1$ only

b) $t=\frac{1}{2}$ only

c) $t=-2$ only

d) $t=1,\ \frac{1}{2}$

e) $t=1,\ \frac{1}{2},\ -2$

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6. An object moves in the *xy*-plane so that its position at any time *t* is given by the parametric equations $x(t)=t^4+1$ and $y(t)=\cos\left(\frac{\pi}{2}t\right)$. What is the rate of change of *y* with respect to *x* at $(2,0)$?

a) $-\frac{\pi}{8}$ b) $-\frac{1}{4}$ c) 4 d) $-\frac{8}{\pi}$

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7. At time $t \geq 0$, a particle moving in the *xy*-plane has a velocity vector given by $v(t) = \langle e^{2t}, \sin(3t), \rangle$. What is the acceleration vector of the particle?

a) $\langle e^{2t}, \cos(3t) \rangle$

b) $\left\langle \frac{1}{2}e^{2t}, \cos(3t) \right\rangle$

c) $\langle 2e^{2t}, 3\cos(3t) \rangle$

d) $\langle 2e^{2t}, -3\cos(3t) \rangle$

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8. What is the total area between the polar curves $r = 4\cos(5\theta)$ and $r = 7\cos(5\theta)$?

a) 14.137 b) 7.069 c) 25.918 d) 51.836

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9. If $x(t)=5\sin t$ and $y(t)=3\cos t$, then $\frac{d^2y}{dx^2}=$

a) $-\frac{3}{5}\cot t$ b) $\frac{3}{5}\tan t$ c) $-\frac{3}{5}\sec^2 t$

d) $\backslash\frac{3}{5}\sec^2 t$ e) $-\frac{3}{25}\sec^3 t$

10. A particle's position $\left(x(t), y(t)\right)$ at time $0 \le t \le 10$ is described by the parametric equations $x'(t) = \dfrac{t}{\sqrt{t^2+4}}$ and $y'(t) = \dfrac{5-t}{\sqrt{10t-t^2}}$. At $t = 0$, the particle's position is $(2, 0)$

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a. At what time is the particle at rest? Justify your answer.

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b. Find the acceleration at t=5.

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c. What is the particle's speed at t=5?

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d. Is the speed at t=5 increasing or decreasing? Justify your answer.

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e. What is the total distance traveled by the particle on $1 \le t \le 9$?

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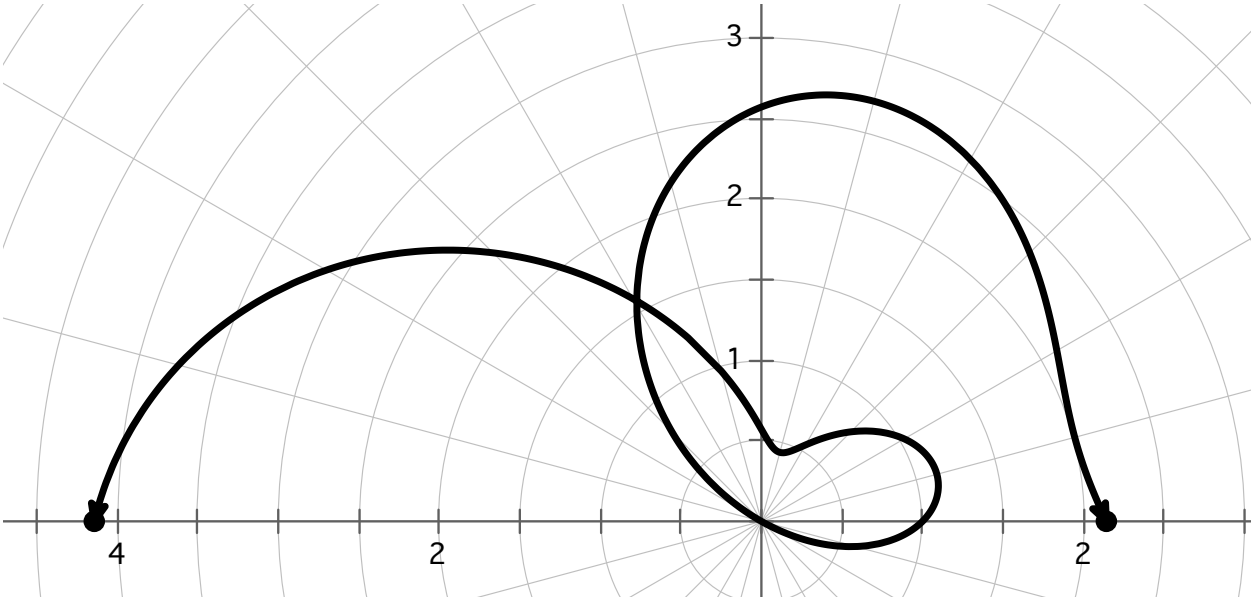
11. The graph below is $r = \theta + \cos 2\theta$ on $\theta \in [-\pi, \pi]$.



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a. What are the points in $\theta \in (-\pi, 0)$I (beside the pole) that are furthest and closest to the origin?

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b. If the curve crosses itself at $r = -.547$ and 1.574, find the area of the region enclosed by the loop.

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c. Find the y-coordinate of the point on $r = \theta + \cos 2\theta$ where $x = -3$. Is r increasing or decreasing at t hose points?
