~~Name~~ ____________________

① In the xy-plane, the graph of the parametric equation $x = 5t + 2$ and $y = 3t$, for $-3 \leq t \leq 3$ is a line segment with slope.

A.) $3/5$ B.) $5/3$ C.) 3 D.) 5 E.) 13

② If $x = t^2 - 1$ and $y = 2e^t$, then $\frac{dy}{dx} =$

A.) $\frac{e^t}{t}$ B.) $\frac{2e^t}{t}$ C.) $\frac{e^{|t|}}{t^2}$ D.) $\frac{4e^t}{2t-1}$ E.) e^t

③ Given $x = 2\sin\theta$ and $y = \cos 2\theta$ find $\frac{dy}{dx}$

A.) $\frac{\sin 2\theta}{\cos 2\theta}$ B.) $\frac{\cos\theta}{\sin 2\theta}$ C.) $\frac{-\cos\theta}{\sin 2\theta}$ D.) $\frac{-\sin 2\theta}{\cos\theta}$

④ Find the 2nd Derivative of the parametric equation given in question 3.

A.) $y = \frac{3}{2}x + 1$ B.) $y = x - 3$ C.) $y = \frac{3}{2} - x$ D.) $y = -1$ E.) $y = -\frac{1}{2}x - 1$

5 . If $x = e^t$ and $y = (t+3)^2$, then $\frac{dy}{dx}$ at $t = 0$ is

(A) 3 (B) 6 (C) 9 (D) 12 (E) 15

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6 A particle moves on the curve $y = \ln(\sqrt{x})$ so that the x-component has velocity $x'(t) = e^t + 1$ for $t > 0$. At time $t = 0$, the particle is at the point $(2, \frac{1}{2}\ln 2)$. At time $t = 1$, the particle is at the point

(A) $\left(e^2, 1\right)$

(B) $\left(e^4, 2\right)$

(C) $\left((e+1), \frac{1}{2}\ln(e+1)\right)$

(D) $\left((e+2), \frac{1}{2}\ln(e+2)\right)$

(E) $\left((e+4), \frac{1}{2}\ln(e+4)\right)$

7 An object moves along a curve in the xy-plane so that its position at any time $t \geq 0$ is given by $(t^2 + 1,\ te^{t/2})$. What is the speed of the object at time $t = 2$?

(A) 3.94 (B) 4.82 (C) 6.75 (D) 8.61 (E) 12.43

8 . A particle moves in the xy-plane so that its position at any time t is given by $x(t) = \arcsin t$ and $y(t) = \ln\sqrt{1-t^2}$. What is the total distance traveled by the particle from $t = -\frac{1}{2}$ to $t = \frac{1}{2}$?

(A) 0.877 (B) 1.099 (C) 1.206 (D) 1.586 (E) 2.243

For what value(s) of t does the curve defined by the parametric equations $x = t^3 - 3t^2 + 2$ and $y = t^4 - 7t$ have a vertical tangent?

(A) 0 only (B) 1 only (C) 2 only (D) 0 and 1 only (E) 0 and 2 only

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(10) The length of the path described by the parametric equations $x = \frac{t}{1+t}$, $y = \ln(1+t)$, for $0 \le t \le 1$, is given by

(A) $\int_0^1 \sqrt{\frac{t^2}{(1+t)^2} + [\ln(1+t)]^2}\, dt$

(B) $\int_0^1 \sqrt{\frac{1}{(1+t)^2} + \frac{1}{(1+t)}}\, dt$

(C) $\int_0^1 \sqrt{\frac{1}{(1+t)^4} + \frac{1}{(1+t)^2}}\, dt$

(D) $\int_0^1 \sqrt{\frac{t}{(1+t)^4} + \frac{1}{(1+t)}}\, dt$

(E) $\int_0^1 \sqrt{\frac{(t+1)}{(1+t)^2}}\, dt$

(11) The position of a particle moving in a xy-plane is given by the parametric equations $x(t) = t^3 - 3t^2$ and $y(t) = t - \ln t^2$. For what values of t is the particle at rest?

(A) −1 only (B) 0 only (C) 2 only (D) −1 and 2 only (E) 0 and 2 only

(12) Find the slope and concavity of the parametric equation, $X = \sqrt{t}$ and $y = \frac{1}{4}(t^2 - 4)$, $t \ge 0$, at the point $(2, 3)$

(A.) $m = 4$ concave up (B) $m = -4$ concave up (C) $m = \frac{1}{4}$ concave down

(D) $m = -8$ concave up (E) $m = 8$ concave up