This print-out should have 8 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

001 10.0 points

Find $\frac{dy}{dx}$ when

$$x(t) = 4te^t, \quad y(t) = t - e^t.$$

1. $\frac{dy}{dx} = \frac{1+e^t}{4e^t(1-t)}$
2. $\frac{dy}{dx} = \frac{4e^t(1+t)}{1-e^t}$
3. $\frac{dy}{dx} = \frac{1-e^t}{4e^t(1+t)}$
4. $\frac{dy}{dx} = \frac{1-e^t}{4e^t(1-t)}$
5. $\frac{dy}{dx} = \frac{4e^t(1-t)}{1+e^t}$
6. $\frac{dy}{dx} = \frac{4e^t(1+t)}{1+e^t}$

002 10.0 points

Find $\frac{dy}{dx}$ when

$$x(t) = t\ln t, \quad y(t) = \sin^4 t.$$

1. $\frac{dy}{dx} = \frac{1+\ln t}{3\sin^3 t\cos t}$
2. $\frac{dy}{dx} = \frac{4\sin^3 t\cos t}{1+\ln t}$
3. $\frac{dy}{dx} = \frac{3\sin^3 t\cos t}{1+\ln t}$
4. $\frac{dy}{dx} = \frac{4\cos^3 t\sin t}{1+\ln t}$
5. $\frac{dy}{dx} = \frac{1+\ln t}{4\sin^3 t\cos t}$
6. $\frac{dy}{dx} = \frac{1+\ln t}{4\cos^3 t\sin t}$
7. $\frac{dy}{dx} = \frac{1+\ln t}{3\cos^3 t\sin t}$
8. $\frac{dy}{dx} = \frac{3\cos^3 t\sin t}{1+\ln t}$

003 10.0 points

Find $\frac{d^2y}{dx^2}$ for the curve given parametrically by

$$x(t) = 1 + 2t^2, \qquad y(t) = 2t^2 + t^3.$$

1. $\frac{d^2y}{dx^2} = \frac{3t}{16}$
2. $\frac{d^2y}{dx^2} = \frac{8t}{3}$
3. $\frac{d^2y}{dx^2} = \frac{3}{16t}$
4. $\frac{d^2y}{dx^2} = \frac{3}{4t}$
5. $\frac{d^2y}{dx^2} = \frac{10}{3t}$
6. $\frac{d^2y}{dx^2} = \frac{10t}{3}$

004 10.0 points

Find an equation for the tangent line to the curve given parametrically by

$$x(t) = e^{2t}, \qquad y(t) = 2t^2 + 4t - 4$$

at the point $P(1, -4)$.

1. $y = 2x - 6$
2. $y = -2x - 2$
3. $y = 4x - 6$
4. $y = 4x - 2$

5. $y = 2x - 2$

6. $y = -2x - 6$

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005 10.0 points

Determine all values of t for which the curve given parametrically by

$$x = t^3 - 3t^2 + 2t\,, \quad y = 3t^3 + t^2 - 2$$

has a horizontal tangent?

1. $t = -2$

2. $t = 0\,, \quad \dfrac{2}{9}$

3. $t = 0\,, \quad 2$

4. $t = -\dfrac{2}{9}$

5. $t = 0\,, \quad -\dfrac{2}{9}$

6. $t = 2$

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006 10.0 points

Find $\dfrac{d^2y}{dx^2}$ when

$$x(t) = \sin 3\pi t\,, \quad y(t) = \cos 3\pi t\,.$$

1. $\dfrac{d^2y}{dx^2} = 3\pi \sec^2 3\pi t$

2. $\dfrac{d^2y}{dx^2} = -3 \sec^2 3\pi t$

3. $\dfrac{d^2y}{dx^2} = -3\pi \sec^3 3\pi t$

4. $\dfrac{d^2y}{dx^2} = -\sec^3 3\pi t$

5. $\dfrac{d^2y}{dx^2} = \sec^3 3\pi t$

6. $\dfrac{d^2y}{dx^2} = 3 \sec^2 3\pi t$

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007 10.0 points

Which one of the following integrals gives the length of the parametric curve

$$x(t) = t^2\,, \quad y(t) = 2t\,, \quad 0 \le t \le 4\,.$$

1. $I = \displaystyle\int_0^4 |t^2 + 1|\, dt$

2. $I = 2\displaystyle\int_0^4 \sqrt{t^2 + 1}\, dt$

3. $I = \displaystyle\int_0^4 \sqrt{t^2 + 1}\, dt$

4. $I = \displaystyle\int_0^2 |t^2 + 1|\, dt$

5. $I = 2\displaystyle\int_0^2 |t^2 + 1|\, dt$

6. $I = 2\displaystyle\int_0^2 \sqrt{t^2 + 1}\, dt$

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008 10.0 points

Find the length of the curve defined by

$$x(t) = \frac{1}{3}(2t + 3)^{3/2}$$

$$y(t) = t + \frac{t^2}{2}$$

for $0 \le t \le 1$.

1. $\frac{5}{2}$

2. $\frac{5}{3}$

3. $\frac{2}{5}$

4. $\frac{3}{2}$

5. $\frac{2}{3}$