This print-out should have 36 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

001 0.0 points

Find an equation for the tangent line to the parabola

$$y = 7x^2 - 5x$$

at the point $P(1, y(1))$.

1. $y = 9x + 7$

2. $y = 8x + 6$

3. $y = 9x - 7$

4. $y = 8x - 6$

5. $y = 10x - 8$

6. $y = 10x + 8$

002 0.0 points

If f is a differentiable function, then $f'(a)$ is given by which of the following without further restriction on f?

$A.$ $\lim_{h \to 0} \dfrac{f(a+h) - f(a)}{h}$,

$B.$ $\lim_{x \to a} \dfrac{f(x) - f(a)}{x - a}$,

$C.$ $\lim_{x \to a} \dfrac{f(x+h) - f(x)}{h}$.

1. A only

2. A, B, and C

3. B only

4. A and C only

5. A and B only

003 0.0 points

Let f be a function such that

$$\lim_{h \to 0} f(1+h) = 2\,,$$

and

$$\lim_{h \to 0} \frac{f(1+h) - f(1)}{h} = 3\,.$$

Which of the following statements are true?

A. f has a removable discontinuity at $x = 1$,

B. f is differentiable at $x = 1$,

C. $f(1) = 3, \quad f'(1) = 2$.

1. none are true

2. B only

3. A and B only

4. A and C only

5. A only

6. all are true

7. B and C only

8. C only

004 0.0 points

For which of the following functions f and corresponding numbers a is the limit

$$\lim_{h \to 0} \frac{(1+h)^6 - 1}{h}$$

the value of $f'(a)$?

1. $f(x) = (x-1)^6, \quad a = 1$

2. $f(x) = x^6, \quad a = 0$

3. $f(x) = x^6, \quad a = 1$

4. $f(x) = x^6, \quad a = 6$

5. $f(x) = (x+1)^6, \quad a = 1$

6. $f(x) = (x+1)^6, \quad a = 6$

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005 0.0 points

Determine if the limit

$$\lim_{x \to \infty} \frac{2x+3}{x^2 - x + 5}$$

exists, and if it does, find its value.

1. limit doesn't exist

2. limit $= 0$

3. limit $= 5$

4. limit $= 3$

5. limit $= \dfrac{3}{5}$

6. limit $= -2$

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006 0.0 points

Determine if

$$\lim_{x \to -\infty} \left(\frac{4x}{x-1} + \frac{6x}{x+1} \right)$$

exists, and if it does, find its value.

1. limit $= 7$

2. limit does not exist

3. limit $= 6$

4. limit $= 8$

5. limit $= 10$

6. limit $= 9$

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007 0.0 points

Determine

$$\lim_{x \to \infty} \frac{x^6 - 3}{x^5 + 7}\,.$$

1. none of the other answers

2. limit $= 3$

3. limit $= 0$

4. limit $= \infty$

5. limit $= 9$

6. limit $= -\infty$

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008 0.0 points

A certain function f is known to have the properties

$$\lim_{x \to -\infty} f(x) = 1, \quad \lim_{x \to \infty} f(x) = 5\,.$$

Determine if

$$\lim_{x \to 0-} \frac{2 + 5x}{5 + f\left(\dfrac{1}{x}\right)}$$

exists, and if it does, compute its value.

1. limit $= \dfrac{1}{2}$

2. limit $= \dfrac{1}{3}$

3. limit $= \dfrac{1}{5}$

4. limit does not exist

5. limit $= \dfrac{7}{6}$

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009 0.0 points

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

$$\frac{4}{\sqrt{x}} + \frac{1}{\sqrt{y}} \;=\; 5\,.$$

1. $\dfrac{dy}{dx} \;=\; -4\Big(\dfrac{y}{x}\Big)^{3/2}$

2. $\dfrac{dy}{dx} \;=\; 4\Big(\dfrac{y}{x}\Big)^{3/2}$

3. $\dfrac{dy}{dx} \;=\; 4(xy)^{1/2}$

4. $\dfrac{dy}{dx} \;=\; \dfrac{1}{4}(xy)^{1/2}$

5. $\dfrac{dy}{dx} \;=\; \dfrac{1}{4}\Big(\dfrac{x}{y}\Big)^{3/2}$

6. $\dfrac{dy}{dx} \;=\; -\dfrac{1}{4}\Big(\dfrac{x}{y}\Big)^{3/2}$

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010 0.0 points

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

$$x^3y^3 - y \;=\; x\,.$$

1. $\dfrac{dy}{dx} \;=\; \dfrac{1+3x^2y^3}{3x^3y^2-2}$

2. $\dfrac{dy}{dx} \;=\; \dfrac{1-2x^3y^3}{2x^3y^2-1}$

3. $\dfrac{dy}{dx} \;=\; \dfrac{1-3x^2y^3}{3x^3y^2-1}$

4. $\dfrac{dy}{dx} \;=\; \dfrac{1-3x^3y^3}{3x^3y^2-2}$

5. $\dfrac{dy}{dx} \;=\; \dfrac{1-3x^3y^2}{3x^2y^2-1}$

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011 0.0 points

The points P and Q on the graph of

$$y^2 - xy + 8 \;=\; 0$$

have the same x-coordinate $x = 6$. Find the point of intersection of the tangents to the graph at P and Q.

1. intersect at $= \Big(\dfrac{8}{3},\, \dfrac{16}{3}\Big)$

2. intersect at $= \Big(\dfrac{8}{3},\, \dfrac{8}{3}\Big)$

3. intersect at $= \Big(\dfrac{16}{3},\, \dfrac{16}{3}\Big)$

4. intersect at $= \Big(\dfrac{16}{3},\, \dfrac{8}{3}\Big)$

5. intersect at $= \Big(\dfrac{8}{3},\, \dfrac{2}{3}\Big)$

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012 0.0 points

Find all the critical points of

$$f(x) \;=\; x(1-x)^{1/5}\,.$$

1. $x \;=\; -1$

2. $x \;=\; 1$

3. $x \;=\; -\dfrac{5}{6}$

4. $x \;=\; -1,\;\; \dfrac{5}{6}$

5. $x \;=\; 1\,,\;\; \dfrac{5}{6}$

6. $x \;=\; \dfrac{5}{6}$

7. $x \;=\; -1,\;\; -\dfrac{5}{6}$

8. $x \;=\; 1,\;\; -\dfrac{5}{6}$

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013 0.0 points

Determine the absolute minimum value of

$$f(x) \;=\; x\sqrt{1-x^2} + 4$$

on $[-1,\, 1]$.

1. absolute min. value $= \dfrac{5}{2}$

2. absolute min. value $= 5$

3. absolute min. value $= 4$

4. absolute min. value $= \dfrac{9}{2}$

5. absolute min. value $= 3$

6. absolute min. value $= \dfrac{7}{2}$

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014 0.0 points

Find the absolute minimum value of

$$f(x) = \frac{1}{3}x^3 - 5x^2 + 16x + 4$$

on the interval $[0, 3]$.

1. abs. min. value $= 3$

2. abs. min. value $= 4$

3. abs. min. value $= 2$

4. none of the other answers

5. abs. min. value $= 5$

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015 0.0 points

The derivative of a function f is given for all x by

$$f'(x) = (2x^2 + 4x - 6)\Big(1 + g(x)^2\Big)$$

where g is some unspecified function. At which point(s) will f have a local maximum?

1. local maximum at $x = 1$

2. local maximum at $x = -3,\ 1$

3. local maximum at $x = -3$

4. local maximum at $x = -1$

5. local maximum at $x = 3$

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016 0.0 points

Find the interval(s) on which

$$f(x) = x^3 - x^2 - 16x + 2$$

is decreasing.

1. $\Big(-2,\ \dfrac{4}{3}\Big)$

2. $\Big(-\infty,\ -\dfrac{8}{3}\Big),\ \Big(2,\ \infty\Big)$

3. $\Big(-\infty,\ -\dfrac{4}{3}\Big),\ \Big(2,\ \infty\Big)$

4. $\Big(-\infty,\ -2\Big),\ \Big(\dfrac{4}{3},\ \infty\Big)$

5. $\Big(-2,\ \dfrac{8}{3}\Big)$

6. $\Big(-\dfrac{8}{3},\ 2\Big)$

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017 0.0 points

Which one of the following properties does

$$f(x) = \frac{x+1}{x^2+24}$$

have?

1. local max at $x = -6$

2. local min at $x = 6$

3. local min at $x = -6$

4. local max at $x = 6$

5. local max at $x = -4$

6. local min at $x = -4$

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018 0.0 points

A 10 foot ladder is leaning against a wall. If the foot of the ladder is sliding away from the wall at a rate of 12 ft/sec, at what speed is the top of the ladder falling when the foot of the ladder is 8 feet away from the base of the wall?

1. speed $=$ 16 ft/sec

2. speed $=$ $\frac{50}{3}$ ft/sec

3. speed $=$ $\frac{49}{3}$ ft/sec

4. speed $=$ $\frac{46}{3}$ ft/sec

5. speed $=$ $\frac{47}{3}$ ft/sec

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019 (part 1 of 2) 0.0 points

A point is moving on the graph of

$$6x^3 + 4y^3 \;=\; xy\,.$$

When the point is at

$$P \;=\; \Big(\frac{1}{10},\; \frac{1}{10}\Big),$$

its x-coordinate is decreasing at a speed of 8 units per second.

What is the speed of the y-coordinate at that time?

1. speed y-coord $=$ -32 units/sec

2. speed y-coord $=$ 32 units/sec

3. speed y-coord $=$ 33 units/sec

4. speed y-coord $=$ -33 units/sec

5. speed y-coord $=$ 31 units/sec

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020 (part 2 of 2) 0.0 points

In which direction is the y-coordinate moving at that time?

1. direction decreasing y

2. direction increasing y

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021 0.0 points

Two cyclists leave simultaneously from the Math Department at UT. One travels north at 8 mph, the other travels east at 6 mph. Determine the rate at which the distance between them is changing after 2 hours of riding.

1. rate $=$ 7 mph

2. rate $=$ 9 mph

3. rate $=$ 8 mph

4. rate $=$ 11 mph

5. rate $=$ 10 mph

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022 0.0 points

Determine if

$$\lim_{x \to -2} \Big(\frac{x^3 + 9x^2 + x + 2}{x^2 + 2}\Big)$$

exists, and if it does, find its value.

1. limit $=$ $\frac{27}{4}$

2. limit does not exist

3. limit $=$ $\frac{23}{4}$

4. limit $=$ $\frac{14}{3}$

5. limit $=$ 4

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023 0.0 points

Find the value of

$$\lim_{x \to 0^+} \frac{2x - \ln x}{4x}\,.$$

1. limit $= \infty$

2. limit $= -\infty$

3. limit $= 4$

4. limit $= \dfrac{1}{2}$

5. limit $= 2$

6. limit $= 0$

7. none of the other answers

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024 0.0 points

Determine if the limit

$$\lim_{x \to -\infty} (1 - 7x)^{\frac{1}{6x}}$$

exists, and if it does, find its value.

1. limit $= 0$

2. limit $= e^{\frac{1}{7}}$

3. limit $= -\infty$

4. limit $= e^{-7}$

5. none of the other answers

6. limit $= 1$

7. limit $= \infty$

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025 0.0 points

Determine

$$\lim_{x \to 0} \frac{2 - 5\cos x + 3e^{-x^2}}{2\sin^2 x}\,.$$

1. limit $= -\dfrac{1}{2}$

2. limit $= -\dfrac{1}{4}$

3. limit $= -\dfrac{3}{4}$

4. limit $= 0$

5. limit does not exist

6. limit $= -1$

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026 0.0 points

Evaluate the integral

$$I \;=\; \int_4^2 (2f(x) - 3g(x))\,dx$$

when

$$\int_2^4 f(x)\,dx \;=\; 4\,, \qquad \int_2^4 g(x)\,dx \;=\; 5\,.$$

1. $I = 10$

2. $I = 7$

3. $I = 9$

4. $I = 8$

5. $I = 11$

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027 0.0 points

Evaluate the definite integral

$$I \;=\; \int_0^{\pi/2} (\cos x - 3\sin x)\,dx\,.$$

1. $I = -2$

2. $I = -5$

3. $I = -4$

4. $I = -1$

5. $I = -3$

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028 0.0 points

Evaluate the integral

$$I = \int_0^3 \left(1 + 4y - y^2\right)\, dy\,.$$

1. $I = 14$

2. $I = 10$

3. $I = 13$

4. $I = 11$

5. $I = 12$

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029 0.0 points

Evaluate the integral

$$I = \int_1^2 \frac{4x^3 - x^2 + 4}{x^2}\, dx.$$

1. $I = \dfrac{15}{2}$

2. $I = \dfrac{13}{2}$

3. $I = 8$

4. $I = 7$

5. $I = 6$

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030 0.0 points

Evaluate the definite integral

$$I = \int_4^7 |x - 6|\, dx.$$

1. $I = -\dfrac{7}{2}$

2. $I = \dfrac{7}{2}$

3. $I = 4$

4. $I = 3$

5. $I = -\dfrac{5}{2}$

6. $I = -3$

7. $I = \dfrac{5}{2}$

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031 0.0 points

If the second derivative of f is given by

$$f''(x) = 8x - 4\cos x,$$

which of the following could be $f(x)$?

1. $f(x) = 4x^2 - 4\sin x - 7x + 2$

2. $f(x) = \dfrac{4}{3}x^3 + 4\cos x - 7x^2 + 2$

3. $f(x) = 4x^2 + 4\sin x - 7x + 2$

4. $f(x) = \dfrac{4}{3}x^3 + 4\cos x - 7x + 2$

5. $f(x) = \dfrac{4}{3}x^3 - 4\cos x - 7x + 2$

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032 0.0 points

Determine the integral

$$I = \int \frac{6 - 5x}{\sqrt{x}}\, dx\,.$$

1. $I = 12\, x^{1/2} - \dfrac{10}{3}\, x^{3/2} + C$

2. $I = 6\, x^{1/2} - \dfrac{10}{3}\, x^{3/2} + C$

3. $I = 12\, x^{1/2} + \dfrac{10}{3}\, x^{3/2} + C$

4. $I = 12\, x^{1/2} - \dfrac{5}{3}\, x^{3/2} + C$

5. $I = 6\,x^{1/2} + \dfrac{10}{3}\,x^{3/2} + C$

6. $I = 6\,x^{1/2} + \dfrac{5}{3}\,x^{3/2} + C$

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033 0.0 points

Evaluate the integral

$$I = \int_0^{\pi/4} \left(\frac{1}{\cos^2\theta} - \sin 2\theta\right) d\theta\,.$$

1. $I = \dfrac{1}{2}$

2. $I = 2$

3. $I = 1$

4. $I = 0$

5. $I = \dfrac{3}{2}$

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034 0.0 points

Evaluate the integral

$$I = \int_0^1 x\,\{f'(x^2) - 2\}\,dx$$

when $f(0) = 1$ and $f(1) = 4$.

1. $I = \dfrac{1}{2}$

2. $I = \dfrac{3}{2}$

3. $I = \dfrac{5}{2}$

4. $I = 2$

5. $I = 1$

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035 0.0 points

Determine the integral

$$I = \int t^2 \cos\left(1 - t^3\right)\,dt\,.$$

1. $I = \dfrac{1}{3}\sin(1 - t^3) + C$

2. $I = \cos(1 - t^3) + C$

3. $I = -\sin(1 - t^3) + C$

4. $I = -\dfrac{1}{3}\sin(1 - t^3) + C$

5. $I = 3\cos(1 - t^3) + C$

6. $I = -3\cos(1 - t^3) + C$

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036 0.0 points

Determine the integral

$$I = \int \frac{4x}{\sqrt[3]{1 + x^2}}\,dx\,.$$

1. $I = 6(1 + x^2)^{\frac{2}{3}} + C$

2. $I = -6(1 + x^2)^{\frac{3}{2}} + C$

3. $I = -3(1 + x^2)^{\frac{2}{3}} + C$

4. $I = -3(1 + x^2)^{\frac{3}{2}} + C$

5. $I = 3(1 + x^2)^{\frac{2}{3}} + C$

6. $I = 6(1 + x^2)^{\frac{3}{2}} + C$