This print-out should have 30 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

001 10.0 points

Find the x- and y-intercepts of the tangent line to the graph of

$$y = (3x + 13)^{1/4}$$

at the point (1, 2).

1. x-intercept $= -\dfrac{58}{3}$, y-intercept $= \dfrac{29}{16}$

2. x-intercept $= -20$, y-intercept $= \dfrac{31}{16}$

3. x-intercept $= -\dfrac{61}{4}$, y-intercept $= \dfrac{61}{32}$

4. x-intercept $= -\dfrac{13}{3}$, y-intercept $= \dfrac{13}{32}$

5. x-intercept $= -\dfrac{61}{3}$, y-intercept $= \dfrac{61}{32}$

002 10.0 points

Find the derivative of f when

$$f(x) = 4(\sin^{-1} x)^2 .$$

1. $f'(x) = \dfrac{4\sin^{-1} x}{\sqrt{1-x^2}}$

2. $f'(x) = \dfrac{8\sin^{-1} x}{1+x^2}$

3. $f'(x) = \dfrac{4\cos^{-1} x}{1+x^2}$

4. $f'(x) = \dfrac{8\cos^{-1} x}{\sqrt{1-x^2}}$

5. $f'(x) = \dfrac{4\cos^{-1} x}{\sqrt{1-x^2}}$

6. $f'(x) = \dfrac{8\sin^{-1} x}{\sqrt{1-x^2}}$

003 10.0 points

Find the slope of the line tangent to the graph of

$$\ln(xy) - 2x = 0$$

at the point where $x = -1$.

1. slope $= \dfrac{3}{2}e^{-2}$

2. slope $= -\dfrac{3}{2}e^{2}$

3. slope $= \dfrac{3}{2}e^{2}$

4. slope $= -3e^{-2}$

5. slope $= 3e^{-2}$

6. slope $= -3e^{2}$

004 10.0 points

Determine $g'(x)$ when

$$g(x) = \frac{4 + xf(x)}{\sqrt{x}},$$

and f is a differentiable function.

1. $g'(x) = \dfrac{2xf(x) + x^2 f'(x) - 4}{x\sqrt{x}}$

2. $g'(x) = \dfrac{xf(x) + 2x^2 f'(x) + 4}{\sqrt{x}}$

3. $g'(x) = \dfrac{xf(x) - x^2 f'(x) + 4}{x\sqrt{x}}$

4. $g'(x) = \dfrac{xf(x) + 2x^2 f'(x) - 4}{2x\sqrt{x}}$

5. $g'(x) = \dfrac{xf(x) - 2x^2 f'(x) + 4}{2x\sqrt{x}}$

6. $g'(x) = \dfrac{2xf(x) + x^2 f'(x) - 4}{\sqrt{x}}$

005 10.0 points

Find the derivative of g when

$$g(x) = x^4 \cos(x)\,.$$

1. $g'(x) = x^3\,(4\cos(x) + x\sin(x))$

2. $g'(x) = x^3\,(4\sin(x) - x\cos(x))$

3. $g'(x) = x^3\,(4\cos(x) - x\sin(x))$

4. $g'(x) = x^3\,(4\sin(x) + x\cos(x))$

5. $g'(x) = x^4\,(3\sin(x) - \cos(x))$

6. $g'(x) = x^4\,(3\cos(x) - \sin(x))$

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006 10.0 points

Values of m and b can be chosen so that the function f defined by

$$f(x) = \begin{cases} 3x^2 + 8, & x \le 2\,, \\ mx + b, & x > 2\,, \end{cases}$$

is differentiable for all values of x.

What is the value of b?

1. $b = -6$

2. $b = -2$

3. $b = -7$

4. $b = -4$

5. $b = -8$

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007 10.0 points

Determine the value of the third derivative of f at $x = 1$ when

$$f(x) = 3\ln(3x+2),$$

1. $f'''(x) = \dfrac{162}{125}$

2. $f'''(x) = \dfrac{486}{125}$

3. $f'''(x) = -\dfrac{162}{125}$

4. $f'''(x) = -\dfrac{81}{125}$

5. $f'''(x) = \dfrac{81}{125}$

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008 10.0 points

Find the derivative of

$$f(t) = \frac{3\ln t}{2 + \ln t}\,.$$

1. $f'(t) = \dfrac{6}{t(2+\ln t)^2}$

2. $f'(t) = \dfrac{6\ln t}{(2+\ln t)^2}$

3. $f'(t) = \dfrac{3}{t(2+\ln t)^2}$

4. $f'(t) = \dfrac{3\ln t}{2+\ln t}$

5. $f'(t) = \dfrac{6\ln t}{2+\ln t}$

6. $f'(t) = \dfrac{3}{t(2+\ln t)}$

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009 10.0 points

Find the value of $F'(7)$ when

$$F(x) = \frac{f(x)}{f(x) - g(x)}$$

and

$$f(7) = 3, \qquad f'(7) = 4,$$
$$g(7) = 2, \qquad g'(7) = 5\,.$$

1. $F'(7) = -7$

2. $F'(7) = 7$

3. $F'(7) = -23$

4. $F'(7) = 23$

5. $F'(7) = 22$

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010 10.0 points

Determine the derivative of

$$f(x) = \frac{x+3}{\sqrt{x-2}}.$$

1. $f'(x) = \dfrac{x-1}{2(x-2)^{1/2}}$

2. $f'(x) = \dfrac{x-7}{2(x-2)^{3/2}}$

3. $f'(x) = \dfrac{x-1}{(x-2)^{1/2}}$

4. $f'(x) = \dfrac{x-7}{2(x-2)^{1/2}}$

5. $f'(x) = \dfrac{x-7}{(x-2)^{3/2}}$

6. $f'(x) = \dfrac{x-1}{(x-2)^{3/2}}$

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011 10.0 points

Find the derivative of

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

1. $f'(x) = \dfrac{4x^{\frac{1}{2}} + 3}{3x^{\frac{5}{4}}}$

2. $f'(x) = \dfrac{4x^{\frac{1}{4}} + 3}{4x^{\frac{3}{4}}}$

3. $f'(x) = \dfrac{4x^{\frac{1}{2}} + 3}{4x^{\frac{5}{4}}}$

4. $f'(x) = \dfrac{4x^{\frac{1}{2}} - 3}{4x^{\frac{3}{4}}}$

5. $f'(x) = \dfrac{4x^{\frac{1}{2}} - 3}{4x^{\frac{5}{4}}}$

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012 10.0 points

Find the derivative of f when

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

1. $f'(x) = \dfrac{3x^{\frac{5}{2}} - 10x^{-\frac{3}{2}} + 2}{2\,x^2}$

2. $f'(x) = \dfrac{3x^{\frac{5}{2}} - 10x^{-\frac{3}{2}} - 1}{x^2}$

3. $f'(x) = \dfrac{3x^{\frac{3}{2}} - 6x^{-\frac{3}{2}} - 2}{2\,x^2}$

4. $f'(x) = \dfrac{x^{\frac{5}{2}} + 10x^{-\frac{5}{2}} + 2}{2\,x^2}$

5. $f'(x) = \dfrac{x^{\frac{3}{2}} - 6x^{-\frac{5}{2}} + 1}{2\,x^2}$

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013 10.0 points

Use linear approximation with $a = 4$ to estimate the number $\sqrt{4.5}$ as a fraction.

1. $\sqrt{4.5} \approx 2\frac{1}{10}$

2. $\sqrt{4.5} \approx 2\frac{1}{40}$

3. $\sqrt{4.5} \approx 2\frac{1}{8}$

4. $\sqrt{4.5} \approx 2\frac{1}{20}$

5. $\sqrt{4.5} \approx 2\frac{3}{40}$

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014 10.0 points

Find $f'(x)$ when

$$f(x) = \sqrt{x^2 + 6x}.$$

1. $f'(x) = \dfrac{2(x+3)}{\sqrt{x^2+6x}}$

2. $f'(x) = \dfrac{x+3}{2\sqrt{x^2+6x}}$

3. $f'(x) = (x+3)\sqrt{x^2+6x}$

4. $f'(x) = \dfrac{1}{2}(x+3)\sqrt{x^2+6x}$

5. $f'(x) = 2(x+3)\sqrt{x^2+6x}$

6. $f'(x) = \dfrac{x+3}{\sqrt{x^2+6x}}$

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015 10.0 points

Find the derivative of f when

$$f(x) = 5\tan^{-1}\left(e^{-x}\right) + 6e^x .$$

1. $f'(x) = \dfrac{e^{-x}+6e^x}{\sqrt{1-e^{-2x}}}$

2. $f'(x) = \dfrac{e^x-6e^{-x}}{\sqrt{1-e^{-2x}}}$

3. $f'(x) = \dfrac{6e^{-x}+e^x}{1+e^{-2x}}$

4. $f'(x) = \dfrac{6e^x+e^{-x}}{1+e^{-2x}}$

5. $f'(x) = \dfrac{6e^x-5e^{-x}}{1+e^{2x}}$

6. $f'(x) = \dfrac{e^{-x}+6e^x}{\sqrt{1-e^{2x}}}$

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016 10.0 points

There is one point in the first quadrant at which the tangent line to the graph of

$$y = 5 + 2x + \frac{3}{2}x^2 - \frac{2}{3}x^3$$

is horizontal. Find the y-coordinate of this point.

1. $y = \dfrac{38}{3}$

2. $y = \dfrac{29}{3}$

3. $y = \dfrac{35}{3}$

4. $y = \dfrac{26}{3}$

5. $y = \dfrac{32}{3}$

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017 10.0 points

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

$$\ln(xy) + x = 4 .$$

1. $\dfrac{dy}{dx} = \dfrac{y(x+1)}{x}$

2. $\dfrac{dy}{dx} = 2$

3. $\dfrac{dy}{dx} = -\dfrac{y(x-1)}{x}$

4. $\dfrac{dy}{dx} = -\dfrac{y(x+1)}{x}$

5. $\dfrac{dy}{dx} = -\dfrac{x+1}{xy}$

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018 10.0 points

Find $f'(x)$ when

$$f(x) = \frac{5x-1}{6x-1} .$$

1. $f'(x) = \dfrac{30x-5}{(6x-1)^2}$

2. $f'(x) = \dfrac{6-5x}{(6x-1)^2}$

3. $f'(x) = -\dfrac{1}{(6x-1)^2}$

4. $f'(x) = \dfrac{1}{(6x-1)^2}$

5. $f'(x) = \dfrac{1}{6x-1}$

019 10.0 points

Find y' when

$$xy + 5x + 4x^2 = 5 .$$

1. $y' = -\dfrac{y + 5 + 8x}{x}$

2. $y' = -(y + 5 + 8x)$

3. $y' = -\dfrac{y + 5 + 4x}{x}$

4. $y' = \dfrac{5 + 4x - y}{x}$

5. $y' = \dfrac{y + 5 + 8x}{x}$

6. $y' = \dfrac{y + 5 + 4x}{x}$

020 10.0 points

Find the derivative of f when

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

1. $f'(x) = \dfrac{(3x - 5)(5 + x^2)^{1/2}}{(x + 3)^2}$

2. $f'(x) = \dfrac{3x - 5}{(x + 3)(5 + x^2)^{1/2}}$

3. $f'(x) = \dfrac{x - 15}{(x + 3)^2(5 + x^2)^{1/2}}$

4. $f'(x) = \dfrac{3x - 5}{(x + 3)^2(5 + x^2)^{1/2}}$

5. $f'(x) = \dfrac{1 - 15x}{(x + 3)^2(5 + x^2)^{1/2}}$

021 10.0 points

Find the value of $f'(0)$ when

$$f(x) = \frac{1}{4}e^{4x} + \frac{1}{4}e^{-x} .$$

1. $f'(0) = \dfrac{3}{4}$

2. $f'(0) = \dfrac{15}{16}$

3. $f'(0) = \dfrac{9}{16}$

4. $f'(0) = \dfrac{13}{16}$

5. $f'(0) = \dfrac{7}{8}$

022 10.0 points

Find the x-intercept of the tangent line to the graph of

$$f(x) = 3\sin(x) + \cos(x)$$

at the point $(0,\ f(0))$.

1. x-intercept $= \dfrac{1}{4}$

2. x-intercept $= 3$

3. x-intercept $= \dfrac{1}{3}$

4. x-intercept $= -\dfrac{3}{4}$

5. x-intercept $= -3$

6. x-intercept $= -\dfrac{1}{3}$

023 10.0 points

Determine $f'(x)$ when

$$f(x) = \frac{\sin(x) - 4}{\sin(x) + 2} .$$

1. $f'(x) = \dfrac{6\sin(x)\cos(x)}{\sin(x) + 2}$

2. $f'(x) = \dfrac{2\cos(x)}{\sin(x) + 2}$

3. $f'(x) = \dfrac{6\cos(x)}{(\sin(x)+2)^2}$

4. $f'(x) = -\dfrac{2\sin(x)\cos(x)}{\sin(x)+2}$

5. $f'(x) = -\dfrac{2\cos(x)}{(\sin(x)+2)^2}$

6. $f'(x) = -\dfrac{6\cos(x)}{(\sin(x)+2)^2}$

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024 10.0 points

Find the derivative of

$$g(x) = \left(\frac{x+2}{x+3}\right)(2x-7).$$

1. $g'(x) = \dfrac{2x^2-12x-5}{x+3}$

2. $g'(x) = \dfrac{2x^2+12x+5}{x+3}$

3. $g'(x) = \dfrac{x^2+12x-5}{(x+3)^2}$

4. $g'(x) = \dfrac{2x^2-12x-5}{(x+3)^2}$

5. $g'(x) = \dfrac{x^2-12x+5}{x+3}$

6. $g'(x) = \dfrac{2x^2+12x+5}{(x+3)^2}$

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025 10.0 points

Find $f'(x)$ when

$$f(x) = \frac{1-x}{2(1+x)}.$$

1. $f'(x) = -\dfrac{1}{(1+x)^2}$

2. $f'(x) = \dfrac{2}{(1+x)^2}$

3. $f'(x) = -\dfrac{2}{(1+x)^2}$

4. $f'(x) = \dfrac{3}{(1+x)^2}$

5. $f'(x) = \dfrac{1}{(1+x)^2}$

6. $f'(x) = -\dfrac{3}{(1+x)^2}$

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026 10.0 points

If $y = y(x)$ is defined implicitly by

$$3y^2 + xy + 2 = 0,$$

find the value of dy/dx at the point $(5, -1)$.

1. $\left.\dfrac{dy}{dx}\right|_{(5,\,-1)} = -1$

2. $\left.\dfrac{dy}{dx}\right|_{(5,\,-1)} = 2$

3. $\left.\dfrac{dy}{dx}\right|_{(5,\,-1)} = -3$

4. $\left.\dfrac{dy}{dx}\right|_{(5,\,-1)} = 3$

5. $\left.\dfrac{dy}{dx}\right|_{(5,\,-1)} = 1$

6. $\left.\dfrac{dy}{dx}\right|_{(5,\,-1)} = -2$

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027 10.0 points

Find the derivative of

$$f(x) = 2\sin^{-1}(e^{3x}).$$

1. $f'(x) = \dfrac{2}{1+e^{6x}}$

2. $f'(x) = \dfrac{2e^{3x}}{1+e^{6x}}$

3. $f'(x) = \dfrac{6e^{3x}}{1+e^{6x}}$

4. $f'(x) = \dfrac{6}{1+e^{6x}}$

5. $f'(x) = \dfrac{6e^{3x}}{\sqrt{1-e^{6x}}}$

6. $f'(x) = \dfrac{6}{\sqrt{1-e^{6x}}}$

7. $f'(x) = \dfrac{2}{\sqrt{1-e^{6x}}}$

8. $f'(x) = \dfrac{2e^{3x}}{\sqrt{1-e^{6x}}}$

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028 10.0 points

Determine the derivative of

$$f(x) = 5\arcsin\left(\frac{x}{3}\right).$$

1. $f'(x) = \dfrac{5}{\sqrt{9-x^2}}$

2. $f'(x) = \dfrac{15}{\sqrt{1-x^2}}$

3. $f'(x) = \dfrac{15}{\sqrt{9-x^2}}$

4. $f'(x) = \dfrac{5}{\sqrt{1-x^2}}$

5. $f'(x) = \dfrac{3}{\sqrt{9-x^2}}$

6. $f'(x) = \dfrac{3}{\sqrt{1-x^2}}$

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029 10.0 points

Find the x-intercept of the tangent line to the graph of

$$f(x) = x + 3\cos(x)$$

at the point $(0,\ f(0))$.

1. x-intercept $= \dfrac{1}{3}$

2. x-intercept $= -3$

3. x-intercept $= \dfrac{3}{4}$

4. x-intercept $= -\dfrac{1}{3}$

5. x-intercept $= 3$

6. x-intercept $= -\dfrac{1}{4}$

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030 10.0 points

Differentiate the function

$$f(x) = \cos(\ln 5x).$$

1. $f'(x) = \dfrac{1}{\cos(\ln 5\,x)}$

2. $f'(x) = \dfrac{\sin(\ln 5\,x)}{x}$

3. $f'(x) = -\sin(\ln 5\,x)$

4. $f'(x) = -\dfrac{\sin(\ln 5\,x)}{x}$

5. $f'(x) = -\dfrac{5\sin(\ln 5x)}{x}$

6. $f'(x) = \dfrac{5\sin(\ln 5x)}{x}$