Problem 1. 1. (1 pt) Suppose that $f(x) = 11e^x - ex^e$. Find $f'(3)$.

$f'(3)$ = _____

Answer(s) submitted:

- (1/3)e(33(e^2) - (3^e) - (e^(3^e)))

(incorrect)

Problem 2. 2. (1 pt) Find an equation for the line tangent to the graph of

$$f(x) = \frac{\sqrt{x}}{7x+7}$$

at the point $(4, f(4))$.

y = _____

Answer(s) submitted:

- (13/175) - (3x/700)

(correct)

Problem 3. 3. (1 pt) Use implicit differentiation to find the slope of the tangent line to the curve

$$2xy^3 + 5xy = 21$$

at the point $(3,1)$.

m = _____

Answer(s) submitted:

- -(7/33)

(correct)

Problem 4. 4. (1 pt) Let $f(x) = 5x^2\cos(3x)$.
Then $f'(x)$ is _____
and $f'(2)$ is _____
$f''(x)$ is _____
and $f''(2)$ is _____

Answer(s) submitted:

- 5x(2cos(3x) - 3xsin(3x))
- 20(cos(6) - 3sin(6))
- -5((9(x^2)-2)cos(3x) + 12x sin(3x)))
- -10(12sin(6) + 17cos(6))

(score 0.75)

Problem 5. 5. (1 pt) Suppose $xy = 3$ and $\frac{dy}{dt} = 2$. Find $\frac{dx}{dt}$ when $x = -1$.

$\frac{dx}{dt}$ = _____

Answer(s) submitted:

- (4/3)

(incorrect)

Problem 6. 6. (1 pt) Find the absolute maximum and absolute minimum values of the function

$$f(x) = x^3 - 6x^2 - 63x + 9$$

over each of the indicated intervals.

(a) Interval = $[-4, 0]$.
1. Absolute maximum = _____
2. Absolute minimum = _____

(b) Interval = $[-1, 8]$.
1. Absolute maximum = _____
2. Absolute minimum = _____

(c) Interval = $[-4, 8]$.
1. Absolute maximum = _____
2. Absolute minimum = _____

Answer(s) submitted:

- -3
- 0
- -1
- 7
- -3
- 7

(incorrect)

Problem 7. 7. (1 pt) Find the most general antiderivative for the function $\left(8x^4 - \frac{7}{x^5} - 3\right)$.
Note: Don't enter the **+C** . It's included for you.
Antiderivative = _____ + C.

Answer(s) submitted:

- ((8(x^5)/5) + (7/(4(x^4))) - (3x))

(correct)

Problem 8. 8. (1 pt) Find $\frac{dy}{dx}$ for the function $y = x^{\cos(x)}$.

$\frac{dy}{dx}$ = _____

Answer(s) submitted:

- ((x^(cos(x) - 1))(cos(x) - xln(x)sin(x))

(incorrect)

Problem 9. 9. (1 pt)
Evaluate the limit using L'Hospital's rule if necessary

$$\lim_{x\to 1}\frac{x^5-1}{x^2-1}$$

Answer: _____

Answer(s) submitted:

- (5/2)

(correct)

Problem 10. 10. (1 pt) Find two positive numbers whose product is 100 and whose sum is a minimum.

Answer: _____, _____

Answer(s) submitted:

- 10
- 10

(correct)

Problem 11. 11. (1 pt) Let $y = 3x^2 + 2x + 3$.
Find the differential dy when $x = 1$ and $dx = 0.1$ _____
Find the differential dy when $x = 1$ and $dx = 0.2$ _____

Answer(s) submitted:

- 0.8
- 1.6

(correct)

Problem 12. 12. (1 pt) Use linear approximation, i.e. the tangent line, to approximate $\frac{1}{0.102}$ as follows: Let $f(x) = \frac{1}{x}$ and find the equation of the tangent line to $f(x)$ at a "nice" point near 0.102. Then use this to approximate $\frac{1}{0.102}$.

_____

Answer(s) submitted:

- 9.80392

(incorrect)

Problem 13. 13. (1 pt) Consider the function

$$f(x) = -2x^3 + 4x^2 - x - 4$$

Find the average slope of this function on the interval $(-3,4)$.

_____

By the Mean Value Theorem, we know there exists a c in the open interval $(-3,4)$ such that $f'(c)$ is equal to this mean slope. Find the two values of c in the interval which work, enter the smaller root first:

_____ $\leq$ _____

Answer(s) submitted:

- -(161/7)
- (1/6)(4-sqrt(10))
- (1/6)(4+sqrt(10))

(score 0.3333333432674408)

Problem 14. 14. (1 pt) Suppose that

$$f(x) = 6x^2 - x^3 - 3.$$

(A) Find all critical numbers of f. If there are no critical numbers, enter 'NONE'.
Critical numbers = _____

(B) Use interval notation to indicate where $f(x)$ is increasing.
Note: Use 'INF' for ∞, '-INF' for $-\infty$, and use 'U' for the union symbol.

Increasing: _____

(C) Use interval notation to indicate where $f(x)$ is decreasing.
Decreasing: _____

(D) List the x-coordinates of all local maxima of f. If there are no local maxima, enter 'NONE'.
x values of local maxima = _____

(E) List the x-coordinates of all local minima of f. If there are no local minima, enter 'NONE'.
x values of local minima = _____

(F) Use interval notation to indicate where $f(x)$ is concave up.
Concave up: _____

(G) Use interval notation to indicate where $f(x)$ is concave down.
Concave down: _____

(H)List the x values of all inflection points of f. If there are no inflection points, enter 'NONE'.
x values of inflection points = _____

(I) Use all of the preceding information to sketch a graph of f. When you're finished, enter a "1" in the box below.
Graph Complete: _____

Answer(s) submitted:

- 0, 4
- [0,4]
- (-INF, 0] U [4, INF)
- 4
- 0
- (-INF, 2)
- (2, INF)
- 2
- 1

(score 0.7777777910232544)

Problem 15. 15. (1 pt) Find the x-coordinate of the absolute minimum for the function

$$f(x) = 2x\ln(x) - 12x, \qquad x > 0.$$

x-coordinate of absolute minimum = _____

Answer(s) submitted:

- (e^5)

(correct)