Problem 1. 7. (1 pt) Use implicit differentiation to find the slope of the tangent line to the curve

$$4xy^3 + 3xy = 7$$

at the point $(1,1)$.

$m =$ _____

Answer(s) submitted:

- `-(7/15)`

(correct)

Problem 2. 8. (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:

- `117`
- `9`
- `65`
- `-383`
- `117`
- `-383`

(correct)

Problem 3. 2. (1 pt) Suppose that the equation of motion for a particle (where s is in meters and t in seconds) is

$$s = (1/3)t^3 - 2t^2 + 4t + 4$$

.

(a) Find the velocity and acceleration as functions of t.

Velocity at time t = _____

Acceleration at time t = _____

(b) Find the acceleration after 1 second.

Acceleration after 1 second: _____

(c) Find the acceleration at the instant when the velocity is 0.

Acceleration: _____

Answer(s) submitted:

- `t^2 - 4t + 4`
- `2t - 4`
- `-2`
- `0`

(correct)

Problem 4. 10. (1 pt) Suppose that

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

(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, 6`
- `(0, 6)`
- `(-INF, 0) U (6, INF)`
- `6`
- `0`
- `(-INF, 3)`
- `(3, INF)`
- `3`
- `1`

(correct)

Problem 5. 1. (1 pt) Find an equation of the tangent line to the curve $y = 4 - 2x - 3x^2$ at $(1, -1)$.

$y =$ _____

Answer(s) submitted:

- `7 - 8x`

(correct)

Problem 6. 13. (1 pt) Evaluate the integral below by interpreting it in terms of areas. In other words, draw a picture of the region the integral represents, and find the area using high school geometry.

$$\int_{-4}^{4} \sqrt{16 - x^2}\, dx$$

_____

Answer(s) submitted:

- `8 (pi)`

(correct)

Problem 7. 11. (1 pt) Find two positive numbers whose product is 196 and whose sum is a minimum.

Answer: _____, _____

Answer(s) submitted:

- `14`
- `14`

(correct)

Problem 8. 4. (1 pt)

Evaluate the following limits. If needed, enter INF for ∞ and MINF for $-\infty$.

(a)

$$\lim_{x \to \infty} \frac{(6-x)(9+3x)}{(3-5x)(2+3x)} =$$

_____

(b)

$$\lim_{x \to -\infty} \frac{(6-x)(9+3x)}{(3-5x)(2+3x)} =$$

_____

Answer(s) submitted:

- `(1/5)`
- `(1/5)`

(correct)

Problem 9. 9. (1 pt) Find the most general antiderivative for the function $\left(6x^4 - \frac{5}{x^3} - 3\right)$.

Note: Don't enter the **+C** . It's included for you.

Antiderivative = _____ + C.

Answer(s) submitted:

- `((6x^5)/5) + (5/(2x^2)) - (3x)`

(correct)

Problem 10. 14. (1 pt) Evaluate the indefinite integral:

$$\int 3x^4 - \frac{4}{x^4} - 3\, dx = \_\_\_\_\_ + C.$$

Answer(s) submitted:

- `((3x^5)/5) + (4/(3x^3)) - (3x)`

(correct)

Problem 11. 3. (1 pt) Find (in terms of the constant a)

$$\lim_{h \to 0} \frac{2(a+h)^2 - 2a^2}{h}.$$

Limit = _____

Answer(s) submitted:

- `4a`

(correct)

Problem 12. 5. (1 pt) Suppose that $f(x) = 12e^x - ex^e$. Find $f'(3)$.

$f'(3)$ = _____

Answer(s) submitted:

- `(12(e^3)(ln(e))) - ((1/3)((e^2)(3^e)))`

(correct)

Problem 13. 15. (1 pt) If $f(x) = \int_x^{16} t^3\, dt$ then $f'(x) =$ _____

Answer(s) submitted:

- `-(x^3)`

(correct)

Problem 14. 6. (1 pt) Find an equation for the line tangent to the graph of

$$f(x) = \frac{\sqrt{x}}{3x+4}$$

at the point $(2, f(2))$.

$y =$ _____

Answer(s) submitted:

- `((11/100)(sqrt(2))) - ((sqrt(2)/200)x)`

(correct)

Problem 15. 12. (1 pt) (A) Estimate the area under the graph of

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

from $x = 0$ to $x = 4$ using 4 approximating rectangles and right endpoints.

Estimate = _____

(B) Repeat part (A) using left endpoints.

Estimate = _____

(C) Repeat part (A) using midpoints.

Estimate = _____

Answer(s) submitted:

- 34
- 50
- 43

(correct)