

1. (10 points) Find $w'(x)$ given that $w(x) = 5x^9e^{12x}$

2. (10 points) Find $g'(x)$ given that $g(x) = \frac{x^8 + 3 \cos(x)}{x^4 + 5 \sin(x)}$

3. (10 points) Find $f'(x)$ given that $f(x) = \cot(\ln(\sec(5x)))$

4. (10 points) Find $\frac{dy}{dx}$ and write your answer in terms of x given the function $y = (8x)^{(9/x)}$

5. (10 points) Find the slope of the line tangent to the curve $x^4y^2 = 75x - 2y$ at the point $(2, 3)$.

6. (10 points) Evaluate the following limit. Simplify your answer.

$$\lim_{x \rightarrow 0} \frac{e^{5x} - 5x - 1}{1 - \cos(9x)}$$

7. (10 points) Determine the x -coordinate for the absolute minimum value of the following function.

$$f(x) = 2 \ln(64x^2 + 1) - 320 \arctan(8x)$$

8. (10 points) A function $f(x)$ is differentiable everywhere and has the following second derivative.

$$f''(x) = \frac{(2x^2 - 288)(x + 3)^{42}(x^2 + 25)}{20e^{16-x}}$$

Find the intervals of concavity for $f(x)$ and state each x -value at which the graph of $f(x)$ has an inflection point.

9. (10 points) The curve $y = f(x)$ has the property that the slope of the curve is always equal to its y -coordinate multiplied by $1/4$. If the curve goes through the point $(\ln(81), 36)$, then find a formula for $f(x)$. Simplify your answer.

10. (10 points) A spherical balloon is being inflated so that its diameter is increasing at a constant rate of 6 cm/min . How quickly is the volume of the balloon increasing when the diameter is 50 cm ?

Students – do not write on this page!

1. (10 points) _____

2. (10 points) _____

3. (10 points) _____

4. (10 points) _____

5. (10 points) _____

6. (10 points) _____

7. (10 points) _____

8. (10 points) _____

9. (10 points) _____

10. (10 points) _____

TOTAL (100 points) _____