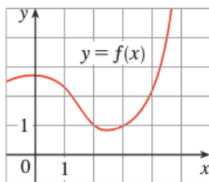


Name: _____

EMPLID: _____

1. (5 points) Differentiate $f(\theta) = \frac{\sin \theta}{1 + \cos \theta}$ and simplify completely.

1. _____



2. (5 points) Use the graph of f to approximate $g'(2)$ when $g(x) = f(x^2)$.

2. _____

3. (5 points) Find $\frac{dy}{dx}$ when $y = x^2 e^{-3x}$.

3. _____

4. (5 points) Find an equation of the tangent line to $y = \sqrt{1 + x^3}$ at $(2, 3)$.

4. _____

5. (5 points) Find $\frac{dy}{dx}$ when $\frac{x^2}{x+y} = y^2 + 1$.

5. _____

6. (5 points) Find y'' when $y = x \ln x^2$.

- A. $\frac{1}{x}$
- B. $\frac{1}{x^2}$
- C. $\frac{2}{x^2}$
- D. $\frac{2}{x}$
- E. none of these

6. _____

7. (5 points) Differentiate $y = e^{\arcsin 5x}$.

7. _____

8. (5 points) (True/False) $\frac{d}{dx}(\ln 10) = \frac{1}{10}$.

8. _____

9. (5 points) A cylindrical tank with radius 5 m is being filled with water at a rate $3 \text{ m}^3/\text{min}$. How fast is the height of the water increasing?

9. _____

10. (5 points) Use linear approximation (or differentials) to estimate $\sqrt{100.5}$.

10. _____

11. (5 points) Find the absolute maximum and absolute minimum of $f(x) = x + \frac{1}{x}$ on the interval $[0.2, 4]$.

11. _____

12. (5 points) Use Rolle's Theorem to prove $x^3 + e^x = 0$ has exactly one real solution.

12. _____