Solutions to Calculus Problems

Civil Engineering Licensure Exam – Mock Exam (Day 5)

February 25, 2025

Solutions

1. Evaluate the limit:
$$\lim_{x \to 3} \frac{x^2 - 9}{x - 3}$$
Solution: Limit of (x^2 - 9)/(x - 3) as x Approaches 3

2. Find the derivative of $f(x) = 5x^3 - 2x^2 + 7x - 4$. **Solution:** Basic Derivative Rules

3. Compute the derivative of $y = e^{3x}$. **Solution:** Derivative of $e^{3x}(ChainRule)$

4. Differentiate $f(x) = \ln(x^2 + 1)$. **Solution:** Derivative of $\ln(x^2 + 1)$

5. Evaluate the limit using L'Hôpital's Rule:
$$\lim_{x \to 0} \frac{\sin x}{x}$$
Solution: Use L'Hôpital's Rule to Find the Limit of sin(x)/x at 0

6. Evaluate the limit:
$$\lim_{x \to 2} \frac{x^2 - 4}{x - 2}$$
Solution: Limit as x Approaches 2 of $(x^2 - 4)/(x - 2)$

7. Differentiate:
$$f(x) = \frac{x^3 - 5x + 2}{x}$$
Solution: Derivative of f(x) = $(5x^3 + 7x^2)/x$

8. Find the equation of the tangent line to $f(x) = x^2 + 3x - 5$ at $x = 2$. **Solution:** How to Find the Equation of the Tangent Line with Derivatives

9. Use implicit differentiation to find $\frac{dy}{dx}$ if:
$$x^2 + y^2 = 25$$
Solution: Find dy/dx by Using Implicit Differentiation: $x^2 + y^2 = 25$

10. Find the critical points of $g(x) = x^3 - 6x^2 + 9x + 4$. **Solution:** Curve Sketching Using Calculus: $x^3 - 6x^2 + 9x - 4$