231 Gateway 2 Practice Test - Differentiation

No uses of Calculators; No Partial Credit. 30 minutes to finish test. More space will be provided on the actual test.

1. (10 pts) Suppose that $f(x) = \dfrac{1}{x-3}$. Use the definition of the derivative to show that the derivative of $f(x)$ at $x = 4$ is -1.

2. (10 pts) Find the derivative: $s = \dfrac{2}{t^3} - \dfrac{1}{t} + 7 + 8t^2$.

3. (10 pts) Find the derivative: $f(u) = \dfrac{1}{\sqrt{u}} - 3\sqrt{u} + \pi$

4. (10 pts) Find the derivative: $r = \theta^3(\cos(\theta))$.

5. (10 pts) Find the derivative: $x = \dfrac{2 + t - t^2}{t^3 - 3t + 1}$.

6. (10 pts) Find the derivative: $y = \sqrt{x^2 + 3x - 1}$.

7. (10 pts) Find the derivative: $v = \cot^4(u)$.

8. (10 pts) Suppose that the point $(4, 5)$ is on the graph of $y = f(x)$ and that the derivative of $f(x)$ at $x = 4$ is 11. Give an equation of the tangent line to $y = f(x)$ at the point $(4, 5)$.

9. (10 pts) Find q'': $q = 3\sin\left(\dfrac{t-1}{\pi}\right)$.

10. (10 pts) Suppose that $x^2y - xy^2 = 2x$. Find y' at the point $(x, y) = (3, 1)$.