

Name: _____

Math 221 Section 10336

Practice Exam 1

May 15, 2012

Follow the instructions for each question and show enough of your work so that I can follow your thought process. If I can't read your work or answer, you will receive little or no credit!

For problems 1 - 4 find the limit if it exists.

1. $\lim_{x \rightarrow 1} \frac{x^2 - 1}{x - 1}$

2. $\lim_{x \rightarrow 3} \frac{2x^2 + 2x - 24}{x - 3}$

3. $\lim_{x \rightarrow \infty} \frac{3x^2 + x - 2}{8x^2 + 23x + \pi}$

4. $\lim_{x \rightarrow \infty} \frac{7x^3 - 4x^2 + 3}{9x^3 - x^2 - x + 2}$

For problems 5 and 6 use the definition of the derivative (4-step process) to compute the derivative of the following functions.

5. $f(x) = \sqrt{x-2}$

6. $f(x) = 3x^2 + 1$

For problems 7 - 14 differentiate each function.

7. $f(x) = 5x^7 + 3x^6 + \pi x^5 + ex^2 - 1$

8. $s(t) = 2t^8 + 3t^5 - 8t^4 + t^2 - 98t + e\pi$

9. $y = x^2\sqrt{x^4 - 3}$

10. $y = 4x^5 \sqrt[3]{x^8 + 3x + 1}$

11. $g(t) = \frac{5t^2 + 2t + 1}{7t + 9}$

12. $h(r) = \frac{5t + 1}{\sqrt{t^2 + 3t + 2}}$

13. $p(x) = \left(x^2 + \frac{1}{x}\right)^{200}$

14. $q(x) = \left(x^2 + x^5 + \frac{1}{x^9}\right)^\pi$

For problems 15 and 16 use implicit differentiation to compute $\frac{dy}{dx}$ for each of the following implicit functions.

15. $2x^3 + x^2y - xy^3 = 2$

16. $x^4(x + y) = y^2(3x - y)$

For problems 17 and 18 compute the equation of the tangent to the given curve at the indicated point.

17. $f(x) = x^2 + \frac{1}{x^2}$ at $x = 1$.

18. $g(x) = x^2\sqrt{x+1}$ at $x = 1$.

For problems 19 and 20 do a complete curve sketching analysis of the indicated curves. In other words find all critical numbers, critical points, inflection points, intervals on which $f(x)$ is increasing/decreasing, intervals of concave up/concave down, and all relative maximum and minimum and finally sketch the curve.

19. $f(x) = x^4 - 4x^3$

20. $f(x) = 2x^3 + 3x^2 - 36x - 5$

21. Compute $\frac{d^8 y}{dx^8}$ for $y = x^8$.

22. Compute $\frac{d^{10} y}{dx^{10}}$ for $y = x^{10}$.