Math 165   Special Assignment I   Lowman   Fall 2010

- Due Thursday, Sept 23 in discussion.

- The Quiz on Thursday, Sep 23 will be based on this assignment.

- The general forms (i.e chain rule versions) of the power, log and exponential rules were given in lectures.

Part I:

1. List all the rules for finding limits.

2. List all the rules for finding derivatives including the general forms of the power rule, log rule and exponential rule.

3. Find the derivative of $f(x) = 2x^2 + x$ by using the limit definition of the derivative.

4. Find the following limits:
    - (a) $\lim_{x \to 3} \frac{2x+3}{x-3}$
    - (b) $\lim_{x \to 3} \frac{9-x^2}{x-3}$
    - (c) $\lim_{x \to 3} \frac{\sqrt{x}-3}{x-9}$
    - (d) $\lim_{x \to \infty} \frac{1}{x}$
    - (e) $\lim_{x \to -\infty} \frac{1}{x}$
    - (f) $\lim_{x \to 0+} \frac{1}{x}$
    - (g) $\lim_{x \to 0-} \frac{1}{x}$
    - (h) $\lim_{x \to 2} (3x^2 + 2)/(\sqrt{(4x^3)} + 2x)$

Part II: Find $\frac{df}{dx}$ for the following functions and simplify answers:

1. $f(x) = \frac{1}{3}x^6 - 2x^2 + 25x$
2. $f(x) = 5\sqrt{x^4}$
3. $f(x) = 25x^2 + \sqrt{x}$
4. $f(x) = 1/(x^{10})$
5. $f(x) = x^2 + 1/(\sqrt{x})$
6. $f(x) = (6x^3 - 4x + 9)/(x^3/4 + 6)$
7. $f(x) = (7x)/(1 + x^2)$
8. $f(x) = (1 - x^3)^4$
9. $f(x) = (1 - 5x^3)^{1/3}$
10. $f(x) = ((x^3 - 2x + 1)^2)^{1/3}$
11. $f(x) = \sqrt{(x^2 - 2x + 1)/(1 - x^3)}$
12. $f(x) = ((3x^2 + 5x)/(1 - 5x^3))^4$
13. $f(x) = a_3x^3 + a_2x^2 + a_1x + a_0$
14. $f(x) = \ln x$
15. $f(x) = x \ln x$
16. $f(x) = \frac{\ln \sqrt[3]{x^2}}{x^4}$
17. $f(x) = (t + \ln t)^{3/2}$
18. $f(x) = \ln(2x^2 + 1)$
19. $f(x) = e^x$
20. $f(x) = e^{x^2+1}$
21. $f(x) = \frac{e^{-3x}}{x^2+1}$
22. $f(x) = xe^{2x}$
23. Use implicit differentiation to find $\frac{dy}{dx}$ when $20 + 2x = 4x^2 + x^3y^4$
24. Use the chain rule to find $\frac{dy}{dx}$ if $y = (x^2+2)^3 - 3(x^2+2)^2 + 1$