Math 206 Midterm Practice Problems Fall 2009
SHOW YOUR WORK

Name ______________________________

(2) Compute the following limits

(a) $\lim_{x\to 1} \frac{x^2-6x+8}{x-2}$

(b) $\lim_{x\to\infty} \frac{10x^5-3x^2+x}{6x^5-3x^3+x-1}$

(c) $\lim_{x\to 4} \sqrt{x^2+x+5}$

(f) $\lim_{x\to 1^+} \frac{2}{x-1}$

(3) Using the definition of a derivative compute the derivative of $f(x) = x^2 + 10$

(4) Compute the derivatives of the following functions. Don't use the definition. Simplify where possible.

(a) $f(x) = 3x^5 - x^4 - 9x + 1$

(b) $g(x) = e^{3x} + \ln x$

(c) $h(x) = e^x \tan x$

(d) $f(x) = 5^{2x^3-x+1}$

(e) $g(x) = \frac{x^2+1}{x^4+1}$

(f) $h(x) = \ln(\tan x + x^4)$

(g) $f(x) = \sqrt{x} + \frac{1}{\sqrt{x}}$

(h) $g(x) = (1+3x^2)^{10}(x^3+2x)^9$

(i) $h(x) = \tan^{-1}(x)$

(5) Using implicit differentiation find y' for $x^4y^3 - 5x^2y^2 + x = 10$

(6) A girl flies a kite at a height of 300 feet, the wind carrying the kite horizontally away from her at a rate of 25 ft/sec. How fast must she let out the string when the kite is 500 feet away from her?

(8) Compute the differential of each of the following

(a) $y = x^3 - x^2 + x$

(b) $y = x^5 \tan x$

(c) $y = \sqrt{4+5x}$ and let $x = 1$ and $dx = \frac{1}{2}$, get a numerical value for dy

(10) Find the equation of the tangent line to $y = (x^3+2)e^{2x-2}$ at $x = 1$.

(11) Compute the first to the sixth derivatives of $f(x) = x^5 + x^4 + x^3 + x^2 + x + 1$

2) Given that $\lim_{x\to 2} f(x) = 4$ and $\lim_{x\to 2} g(x) = 10$ evaluate the following limits.

(a) $\lim_{x\to 2}[f(x) - g(x)] =$

(b) $\lim_{x\to 2} \frac{f(x)}{f(x)+g(x)} =$

(c) $\lim_{x \to 2} e^{g(x)} =$

3) Evaluate the following limits

(a) $\lim_{x \to 2} (x^3 - 3x^2 + x - 7) =$

(b) $\lim_{x \to 1} \frac{x^2 + x - 2}{x^2 + 2x - 3} =$

(c) $\lim_{x \to 2} \sqrt{4x + 1} =$

(d) $\lim_{x \to \infty} \frac{4x^4 - 5x^3 + x^2 + 1}{9x^4 + 6x^2 + 10} =$

(e) $\lim_{x \to 0} \frac{\sin 8x}{3x} =$

(f) $\lim_{x \to 2^+} \frac{1}{x - 2} =$

(g) $\lim_{x \to 0} \frac{\sqrt{x + 3} - \sqrt{3}}{x} =$

5) Show that the equation $x^3 + 3x - 2 = 0$ has a solution in $(0, 1)$. State any theorems you use.

6) Using the definition of a derivative compute the derivative of $f(x) = 2x^2 + x + 8$.

7) Compute the derivatives of the following functions. Do not use the definition of a derivative.

(a) $f(x) = x^5$

(b) $f(x) = 12$

(c) $f(x) = \sqrt[3]{x} - \sqrt[5]{x}$

(d) $f(x) = 10e^x$

(e) $f(x) = 3x^5 - 2x^4 + 10x + 6$

(f) $f(x) = e^x + \tan x$

(g) $f(x) = 5^x - \sec x$

(h) $f(x) = \frac{4}{x^5} - \frac{1}{\sqrt{x}}$

8) Use the product rule to compute the derivatives of the following functions.

(a) $f(x) = (x^3 + x + 1)e^x$

(b) $f(x) = \sin x \cos x$

(c) $f(x) = 10^x \tan x$

(d) $f(x) = \tan x \cot x$

9) Use the quotient rule to compute the derivatives of the following functions.

(a) $f(x) = \frac{x^2 + 1}{x^2 - 1}$

(b) $f(x) = \frac{\tan x}{e^x + x^2}$

(c) $f(x) = \frac{e^x}{1 - x}$

(d) $f(x) = \frac{10^x - x}{x^3 + 4}$

10) Use the chain rule to compute the derivatives of the following functions.

(a) $f(x) = (6x^3 + x - 23)^{16}$

(b) $f(x) = \sin(e^x + x^4)$
(c) $f(x) = e^{(x^2+x+1)}$

(d) $f(x) = \left(\dfrac{x-1}{x+1}\right)^{10}$

11) For the functions given below find the equation of the tangent line at the specified point.
(a) $f(x) = x^4 + x^2 + x + 1$, $(1, 4)$
(b) $f(x) = xe^x + \sin x$, $(0, 0)$