Spring 99 Bogacki

Math 211
Sample Test 1

1. Use the definition of the derivative to obtain $f'(x)$ when $f(x) = \frac{x+1}{x}$.

2. Evaluate the following limits, if they exist.

a) $\lim_{x \to 2^-} \frac{x^2+4}{x^2-4}$ b) $\lim_{x \to 0} \frac{-2}{x \csc x}$ c) $\lim_{x \to -2} \frac{x^2+4x+4}{x^2-4}$

d) $\lim_{x \to 4} \frac{\sqrt{x^2+9}}{-x-4}$ e) $\lim_{x \to -\infty} \frac{\sqrt{2x^2+1}}{x+1}$ f) $\lim_{x \to \infty} \frac{5x^4-4}{2-x-x^3}$

3. Find all the values of x where line tangent to the graph of $f(x) = 3x^4 - 4x^3 + 2$ is horizontal.

4. Find $\frac{dy}{dx}$ if

a) $y = 3x^4 - \sqrt{x} + \pi - \frac{1}{x}$ b) $y = \cos^3(2x^4 + x)$

c) $y = \frac{\sec x + x}{\tan x - x}$ d) $y = (3x^2 - \sin x + 1)(\csc x + \sqrt[3]{x})$

e) $xy + x^3 + y^3 = \cos x \sin y$ f) $y = \sqrt[3]{4x^2 - \cot x}$

5. Given $f(x) = \frac{1}{x} + \sin x$, find $f''(x)$.

6. Find the equation of the line tangent to the graph of $f(x) = \frac{-2}{2x+1}$ at the point $(-1, 2)$.

7. Find the equations of the lines tangent and normal to the curve $xy^2 + 4y = 0$ at the points:
a) (4, - 1) ; b) (2,2)

8. Evaluate

a) $\int \frac{x+x^2}{\sqrt{x^3}} dx$ b) $\int (\sin x - x + 1)\, dx$

9. Let $f(x) = \begin{cases} x^2 - 5x + 7 & , \ x < 2 \\ \cos(x-2) & , \ x \geq 2 \end{cases}$. Determine whether or not $f(x)$ is continuous at $x = 2$.
(Justify your answer.) If not, give a formula for the continuous extension to that point, if one exists.