University of Calgary
Faculty of Science
Department of Mathematics and Statistics

Calculus I Fall 2009

Reading Week Sheet

1. i. Determine values of *a* and *b* so that the function given is continuous.

$$f(x) = \begin{cases} ax^2 + bx - 1 & x < -3 \\ 2 & x = -3 \\ x^2 - ax + 2b & x > -3 \end{cases}$$

ii. Give an example of a function which is continuous at x = 2 and which is not differentiable at x = 2.

2. Determine each of the following limits if the limit exists. If the limit does not exist, justify your answer.

a. $\lim_{x \to -\infty} \left(\sqrt{9x^2 - 7x + 6} - \sqrt{9x^2 - 4x + 5} \right)$

b. $\lim_{x \to 3} \left(\frac{x^2 + 4x - 21}{x^2 - 6x + 9} \right)$

c. $\lim_{x \to 0} \left(\frac{\sin(2x) \tan(3x)}{1 - \cos x} \right)$

d. $\lim_{x \to -\infty} \left(\frac{\sqrt{9x^2 - 7x + 6}}{4 - 5x} \right)$

3. Use the definition of the derivative as a limit to determine f'(x) in each case.

a. $f(x) = \sqrt{x^2 + 4}$

b. $f(x) = 4x - x^2$

c. $f(x) = \left(\frac{2x - 1}{4 - 3x} \right)$

University of Calgary
Faculty of Science
Department of Mathematics and Statistics

Calculus I Fall 2009

Reading Week Sheet

4. In each case, determine the equation of the tangent and normal lines to the curve given at the given point.

   a. $y = x^2 \ln x \quad \textit{at the point} \quad (e^2, 2e^4)$.

   b. $y = x\, e^{2x} \quad \textit{at the point where} \quad x = 3$

   c. $y = e^{\sin 2x} \quad \textit{at the point where} \quad x = \dfrac{\pi}{12}$

5. In each case, determine the x- and y-intercepts, horizontal and vertical asymptotes, regions of increase and decrease, local maxima and minima, concavity, points of inflection, where they exist. Use the information obtained to sketch the curve.

   a. $y = \dfrac{1}{x^2} - \dfrac{1}{(x-2)^2}$

   b. $y = x\sqrt{2+x}$

   c $y = x^4 - 3x^3 + 3x^2 - x$

   d. $y = x + \ln(x^2 + 1)$

   e. $y = x\, e^{-x}$

6. Select two problems on Related Rates from your text.
   Select two maximum/minimum problems from your text.
   Work hard while you enjoy the break. There will be extended office hours after the break.