

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

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

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

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

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  
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Calculus I

Fall 2009

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

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

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

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

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

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.