University of Calgary
Faculty of Science
Department of Mathematics and Statistics

Math 249-L05 Fall 2005

Worksheet 7
[Derivatives and applications]

1. Determine the points on the curve $y = 2x^3 - 9x^2 - 24x + 4$ where the tangent line to the curve is parallel to the x-axis.

2. Use the definition of the derivative as a limit to determine $f'(x)$ given that

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

   b. $f(x) = \dfrac{1}{x^2 - 4}$

   c. $f(x) = \dfrac{4x + 5}{3 - 5x}$

   d. $f(x) = \dfrac{1}{\sqrt{4 - x^2}}$

   In each case check your answer by using the rules for differentiation.

3. In each case, determine $f'(x)$ given $f(x)$.

   i. $f(x) = \sin\left(x^4 + x^3\right)$

   ii. $f(x) = \tan\left(\sqrt{4 - x^3}\right)$

   iii. $f(x) = \sec\left(x^{2/3} - x\right)$

   iv. $f(x) = csc\left(\sqrt{x^4 + 1}\right)$

   v. $f(x) = \cos\left(\cos\left(\cos x\right)\right)$

   vi. $f(x) = \cot\left(\sin\left(x^3 + 1\right)\right)$

   vii. $f(x) = \sqrt{x^2 + \sqrt{x^2 + \sqrt{x^2 + 1}}}$

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4. Determine all points on each graph of the function given where the tangent line is parallel to the x-axis.

   a $y = x^4 - x^2 + 1$

   b $y = \sin 2x - 2 \sin x$

   c $y = \tan x + \cot x$

5. Determine whether or not the given curve has a tangent line which is parallel to the x-axis:

   a $y = 2x^3 + 3x^2 + 6x + 12$

   b $y = 2x^3 - x^2 + 2x - 1$

6. Exercises 3.1, 3.2, 3.3, 3.4, 3.5, 3.6 in the text.