Calculus

Name: Date:

2C Exercises

Product and Quotient Rule

Find the derivative of the function.

25. $f(x) = \dfrac{4 - 3x - x^2}{x^2 - 1}$

27. $f(x) = x\left(1 - \dfrac{4}{x + 3}\right)$

Idea: distribute first to rewrite $f(x)$

29. $f(x) = \dfrac{3x - 1}{\sqrt{x}}$

33. $f(x) = \dfrac{2 - \dfrac{1}{x}}{x - 3}$

35. $f(x) = (2x^3 + 5x)(x - 3)(x + 2)$

Hint: Either use the product rule twice, or multiply the last 2 factors first.

37. $f(x) = \dfrac{x^2 + c^2}{x^2 - c^2}$, c is a constant

Write the equation of the tangent lines through the given point.

63. $f(x) = (x^3 + 4x - 1)(x - 2), \quad (1, -4)$

66. $f(x) = \dfrac{(x - 1)}{(x + 1)}, \quad \left(2, \dfrac{1}{3}\right)$

83. ***Area*** The length of a rectangle is given by $6t + 5$ and its height is $\sqrt{t}$, where t is time in seconds and the dimensions are in centimeters. Find the rate of change of the area with respect to time.

87. ***Population Growth*** A population of 500 bacteria is introduced into a culture and grows in number according to the equation

$$P(t) = 500\left(1 + \frac{4t}{50 + t^2}\right)$$

where t is measured in hours. Find the rate at which the population is growing when $t = 2$.

Find the second derivative

97. $f(x) = \dfrac{x}{x - 1}$

99. $f(x) = x \sin x$

AP Practice...

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
−1	3	4	−2	2
0	2	−3	5	−1

The table above gives values for two differentiable functions and their derivatives at selected values of x. Use the table to evaluate the following.

(a) $h'(0)$ if $h(x) = \dfrac{f(x)}{g(x)}$

(b) $h'(-1)$ if $h(x) = x \cdot f(x) \cdot g(x)$