Math S-Xab Summer 2004
Worksheet: Differentiation Rules
July 13, 2004

1. Find the derivative of each of the following functions using the differentiation rules discussed in class and the fact that $\frac{d}{dx}\sqrt{x} = \frac{1}{2\sqrt{x}}$. Cite each differentiation rule as you use it.

   (a) $y = x^{10}$

   (b) $f(t) = t^{-3}$

   (c) $y = \pi^2$

   (d) $x(t) = \dfrac{t^3 - 2t + 4}{t^3 - t + 2}$

   (e) $(x^2 - 7x + 4)(x^3 - x + 3)$

   (f) $y = \dfrac{\sqrt{x}}{x^2 - x + 5}$

   (g) $f(x) = (x^2 + 1)^3$

   (h) $f(x) = (x^5 + 3x^2 - 4)\sqrt{x}$

   (i) $f(x) = x^5 - \pi^5$

   (j) $s(t) = 3t^6 - 2t^2 + 3t + 6t^{-1} - t^{-7}$

2. Suppose that $f(5) = 1$, $f'(5) = 6$, $g(5) = -3$, and $g'(5) = 2$. Find the following values.

   (a) $(fg)'(5)$

   (b) $\left(\dfrac{f}{g}\right)'(5)$

   (c) $\left(\dfrac{g}{f}\right)'(5)$

3. If f is a differentiable function, find an expression for the derivative of each of the following functions.

   (a) $y = x^2 f(x)$

   (b) $y = \dfrac{f(x)}{x^2}$

   (c) $y = \dfrac{x^2}{f(x)}$

   (d) $y = \dfrac{1 + xf(x)}{\sqrt{x}}$