MATH 220: CALCULUS I

WORKSHEET 9

FEBRUARY 14, 2013

List of some short-cut rules:

$\frac{d}{dx}(x) = 1$ $\frac{d}{dx}(c) = 0$ $\frac{d}{dx}(x^n) = nx^{n-1}$ $\frac{d}{dx}(e^x) = e^x$

$\frac{d}{dx}(cf(x)) = cf'(x)$ $\frac{d}{dx}(f(x) + g(x)) = f'(x) + g'(x)$

Derivative = slope of the tangent line = instantaneous rate of change

Homework: In Section 3.1, do problems 3-30, 33, 35, 47, 51, 53

(Hint: A *normal line* is a line perpendicular to a tangent line.)

(1) Find the equations of lines tangent to and normal to $f(x) = x^4 + 2x^2 - x$ at the point $(1, 2)$.

(2) Where does the graph $y = \frac{3x^4}{4} + x^3 - 3x^2 + 5$ have horizontal tangent lines?

(3) Practice applying these differentiation rules to the following functions:

(a) $f(x) = \dfrac{5}{\sqrt[3]{x}}$

(b) $f(x) = 3e^x - 6x^4 + 10$

(c) $g(y) = y^{-1} + \dfrac{y^3}{2} - \pi y + x$

(d) $f(x) = (1 - \sqrt{x})(x^{3/2} + 5x^2)$

(e) $h(t) = e^r + e^s - e^t$

(f) $C(r) = \pi r^2$