

Worksheet # 9: Derivatives of Polynomial and Exponential Functions

1. Comprehension check.

- (a) True or false: If $f'(x) = g'(x)$ then $f(x) = g(x)$?
- (b) Find an example which shows that in general $(f(x)g(x))' \neq f'(x)g'(x)$.
- (c) Suppose $f'(a)$ exists. Does $\lim_{x \rightarrow a} f(x) = f(a)$? Explain.
- (d) How is the number ϵ defined?

2. Compute the derivative of the following functions.

- (a) $f(x) = \frac{9}{4}x^8$
- (b) $k(x) = 3e^x + x^2 + 1$
- (c) $k(x) = \frac{A}{x^4} + Bx^2 + Cx + D$
- (d) $n(x) = e^{x+2} + 1$
- (e) $l(x) = \left(x + \frac{1}{x}\right)^2$
- (f) $p(x) = c_n x^n + c_{n-1} x^{n-1} + \dots + c_1 x + c_0$

3. Let $f(x) = x^2 + 3x - 5$. Where is the slope of $f(x)$ positive? Negative? Zero?

4. Find an equation for the tangent line to $y = x^{3/2} + 2$ at $x = 3$.

5. (MA 113 Exam II, problem 8, Spring 09). Consider the function $f(x) = x^2 - 2x + 2$. Find the equations of the tangent lines to this parabola which pass through the point $(3, 4)$. As usual, a sketch of the curve and the tangent lines should be your first step in solving the problem.

6. Suppose $x(t) = 2t^3 + 3t^2 - 72t + 50$ gives the position of a particle on the x axis at time t . Determine all time values when the particle is at rest.