

MCS118, Calculus with Pre-calc Review

Derivative worksheet

Here are some functions to differentiate. Note that in most cases, you will want to rewrite the function first so that it fits the rules for differentiating.

1. Find $f'(x)$ for:

(a) $f(x) = 39x^3 - 5x^2 + 17x^{-3} - 2x^{-1}$

(b) $f(x) = (3x + 2)(x - 5)$

(c) $f(x) = (x + \frac{1}{x})$

(d) $f(x) = \frac{x^3 - 13x^4}{x^2}$

(e) $f(x) = 2x\sqrt{x} - \sqrt[3]{x^4}$

2. Find $\frac{dy}{dx}$ if

(a) $y = x - 3x^{12} + 5x^2$

(b) $y = x - \frac{5}{4x^2}$

(c) $y = \sqrt[3]{x^5} + \frac{1}{\sqrt[4]{x^5}}$

(d) $y = x^3 - \frac{3}{x^3} + x^2\sqrt{x}$

(e) $y = \frac{2x^2 - x - 3}{x + 1}$

3. Find the line that is tangent to $y = 5x^2 - 3x + 7$ at the point $(-1, 15)$.

4. Barbara throws a fresh, very ripe grapefruit (from California) from the top of Olin Hall. The height (in feet) of the grapefruit is given by the formula $h(t) = -16t^2 - 4t + 104$.

(a) Find a formula for the instantaneous velocity of the grapefruit.

(b) How fast is it going when $t = 2$? Why is this value negative?

(c) When will the grapefruit hit Tom? Assume Tom is six feet tall.

(d) How fast is it going when it hits Tom?

5. Here are the derivatives of some functions. Guess what the original function was. Check your answer by differentiating your guess.

(a) $f'(x) = 3x^2 - 2x + 1$. What was $f(x)$?

(b) $f'(x) = \frac{3}{2}x^{\frac{1}{2}} + 2x$. What was $f(x)$?

(c) $f'(x) = 17$. What was $f(x)$?

(d) $\frac{dy}{dx} = 6x^2 + 4x$. What was y ?

(e) $\frac{dy}{dx} = x^3 + x^2$. What was y ?