Precalculus

Lesson: Beyond Chapter 14: The Derivative Saga Continues

Mrs. Snow, Instructor

We have found that algebraically solving limits is often long and laborious. This last section of Precalculus is designed to introduce you to some of the rules of differentiation that enable us to calculate with relative ease the derivatives of polynomial, rational functions, algebraic functions, exponential and logarithmic functions, and trigonometric functions. The rules may be used to solve problems involving rates of change, tangents to parametric curves, approximation of functions, and many more applications.

If we take a derivative of a function, we calculate the slope of the curve. What if that curve is a straight line? What if the curve is a horizontal line?

What's the pattern?

$f(x) = 4$	$f(x) = 3x^1$	$f(x) = x^2$	$f(x) = 4x^3$
$4x^0$	$3x^1$	$2x^{2-1}$	$3(4)x^{3-1}$
$f'(x) = 0$	$f'(x) = 3$	$f'(x) = 2x$	$f'(x) = 12x^2$
$(0)4x^{0-1} = 0$	$1(3)x^{1-1} = x^0 = 1$		

Flashback: $m = \lim\limits_{x \to a} \dfrac{f(x) - f(a)}{x - a}$ or $m = \lim\limits_{h \to 0} \dfrac{f(a+h) - f(a)}{h}$

14.3 #1: Find the slope of the tangent line to the graph $f(x) = 3x + 4$ *at the point* $(1, 7), m = 3$

10. $f(x) = x^2 + 2x^1$ *find* $f'(a)$, $m = 2a + 2$

$2(x^{2-1}) + 1(2)x^{1-1} = 2x + 2$

7. $f(x) = 2 - 3x^1 + x^2$ *at* $x = -1$, $m - 5$

$-3 + 2x \Rightarrow -3 + 2(-1) = -5$

9. $F(x) = \frac{1}{\sqrt{x}}$ *at* $x = 4$, $m = -1/16$

$= x^{-\frac{1}{2}} = -\frac{1}{2}x^{-\frac{1}{2} - 1} = \frac{-1}{2}\left(\frac{1}{x^{3/2}}\right) = \frac{-1}{2}\left(\frac{1}{4^{3/2}}\right) = \frac{-1}{16}$

Common alternatives for derivative notation:

Using the notation of $y = f(x)$ to indicate that the independent variable is x and the dependent variable is y,, then some common alternative notations for the derivative are as follows:

$$f'(x) = y' = \frac{dy}{dx} = \frac{d}{dx}f(x) = Df(x) = D_x f(x)$$

Rules for differentiation:

Derivative of a Constant Function $$\frac{d}{dx}(c) = 0$$ derivative of a number = 0
The Power Rule: If n is any real number, then $$\frac{d}{dx}(x^n) = nx^{n-1}$$ bring exponent down as coefficient
The Constant Multiple Rule $$\frac{d}{dx}[cf(x))] = c\frac{d}{dx}f(x)$$ coefficient will be multiplied be derivative
Difference Rule $$\frac{d}{dx}f(x) - g(x) = \frac{d}{dx}f(x) - \frac{d}{dx}g(x)$$ may look at individual terms separately
Derivative of *e* $$\frac{d}{dx}(e^x) = e^x$$