Precalc 15.2

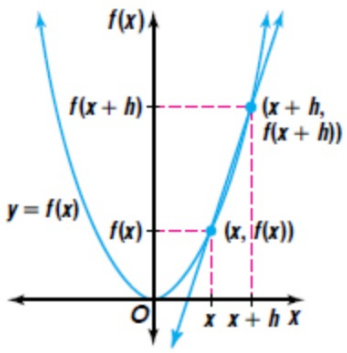
Find derivatives of polynomial functior
Use derivatives in applications

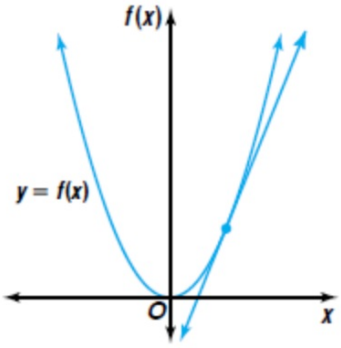
tangent line

secant line

derivative m @ plac
x =

differentiation





Derivative of a Function

The derivative of the function $f(x)$ is the function $f'(x)$ given by

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}.$$

1 a. Find an expression for the slope of the tangent line to the graph of $y = x^2 + 3x - 2$ at any point. That is, compute $\frac{dy}{dx}$.

b. Find the slopes of the tangent lines when $x = 0$ and $x = 3$.

a) $\frac{dy}{dx} = 2x + 3$

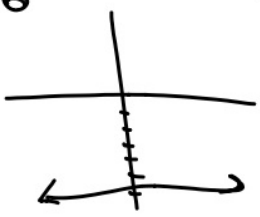
b) @ $x = 0$: 3

@ $x = 3$: 9

What's the rule?

$f(x)$	$f'(x)$
x^2	$2x$
x^3	$3x^2$
x^4	$4x^3$
x^{10}	$10x^9$
→ x^n	nx^{n-1}
$x^2 + 3x^{1-1}$	$2x + 3x^0 = 2x + 3 \cdot 1 = 3$
$x^4 + 5x^{1-1}$ x^0	$4x^3 + 5$
5. $2x^5 - 3x^4 + 2x$	$10x^4 - 12x^3 + 2$
$3x^8 - 6$	$24x^7 + 0$

$y = -6$



Derivative Rules	Constant Rule:	The derivative of a constant function is zero. If $f(x) = c$, then $f'(x) = 0$.
	Power Rule:	If $f(x) = x^n$, where n is a rational number, then $f'(x) = nx^{n-1}$.
	Constant Multiple of a Power Rule:	If $f(x) = cx^n$, where c is a constant and n is a rational number, then $f'(x) = cnx^{n-1}$.
	Sum and Difference Rule:	If $f(x) = g(x) \pm h(x)$, *then* $f'(x) = g'(x) \pm h'(x)$.

2 **Find the derivative of each function.**

a. $f(x) = x^6$

b. $f(x) = x^2 - 4x + 2$

c. $f(x) = 2x^4 - 7x^3 + 12x^2 - 8x - 10$

Use the derivative rules to find the derivative of each function.

6. $f(x) = 2x^2 - 3x + 5$

7. $f(x) = -x^3 - 2x^2 + 3x + 6$

d. $f(x) = x^3 (x^2 + 5)$

Use distr prop

$= x^5 + 5x^3$

$f'(x) = 5x^4 + 15x^2$

EWE

e. $f(x) = (x^2 + 4)^2$

$x^4 + 8x^2 + 16$

$f'(x) = 4x^3 + 16x$