1.5   The Derivative Function
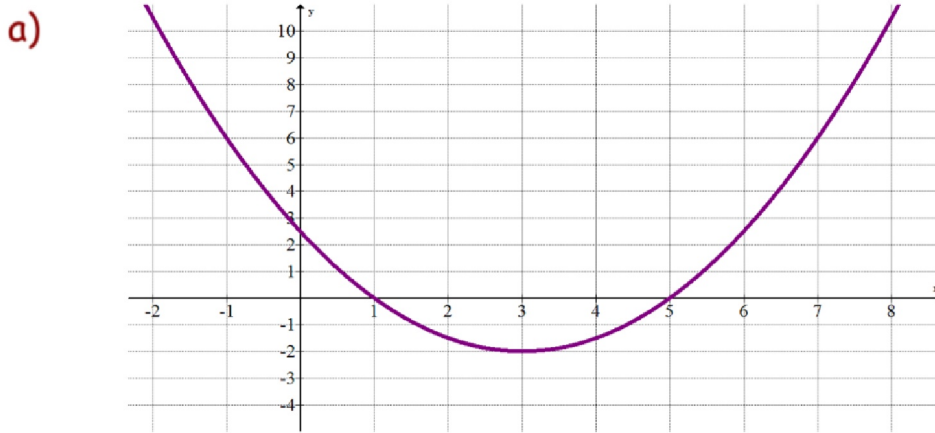
Ex. 1   **Link to "curve surfer"**
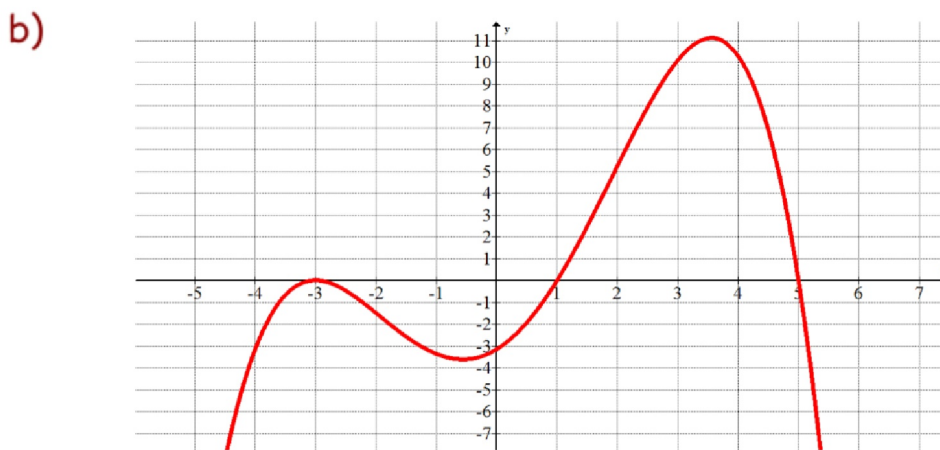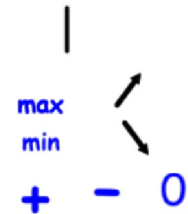
For each of the functions graphed below indicate:
- intervals of increase and decrease   ╱ ╲
- local maxima and minima   max   min
- when the slope of the tangent (aka the instantaneous rate of change) is positive, negative, or zero **+** **—** **0**

a)

f(x) [   ]

m_{tan} [   ]

max
min
+ **—** 0

b)

f(x) [   ]

m_{tan} [   ]

max
min
+ **—** 0

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1

c)

f(x) [   ]
m_{tan} [   ]

max ↗ ↗
min ↗ ↗

+   −

0

d)

f(x) [   ]
m_{tan} [   ]

max ↗ ↗
min ↗ ↗

+   −

0

e)

f(x) [   ]
m_{tan} [   ]

max ↗ ↗
min ↗ ↗

+   −

0

Summary:

When f(x) is increasing, m_{tan} is _____.
When f(x) is decreasing, m_{tan} is _____.
At local max/mins, m_{tan} is _____.

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For a given function, f(x), it is possible to determine the instantaneous rate of change of the function (m_{tan}) for every "x" value of the function.

The relationship between "x" and its corresponding m_{tan} creates a new function, f'(x), which is called the <u>derivative function.</u>

read as "f prime of x"

The coordinates of the points on the derivative function are (x, f'(x)).

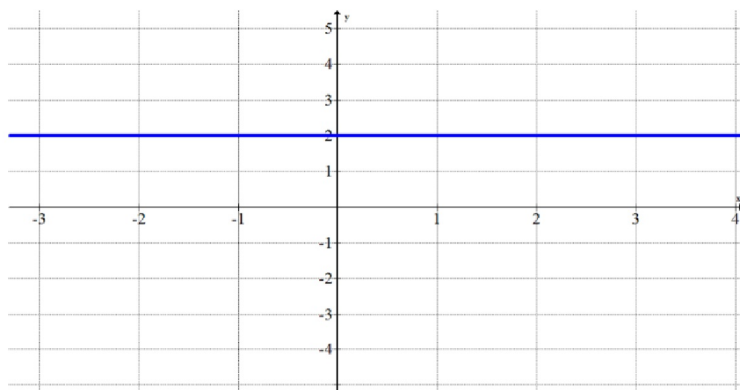alternate notations: $f'(x) = y' = \dfrac{dy}{dx}$

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Let's Explore: What do derivative functions look like?

- Determine the value of the slope of the tangent for different values of x.
- Sketch the derivative function....if possible write the equation of f'(x).
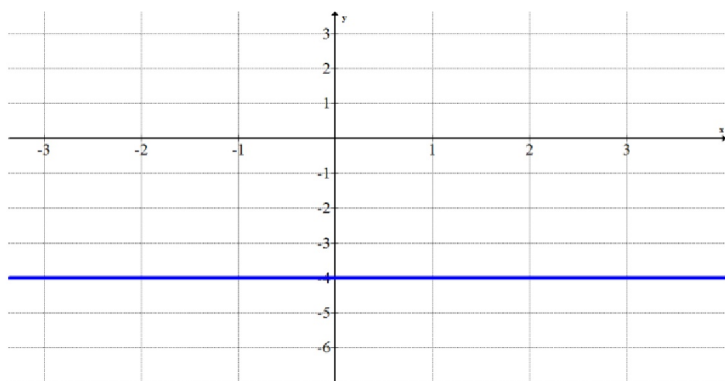
A: Constant Functions

$f(x) = 2$ $f'(x) =$ _____

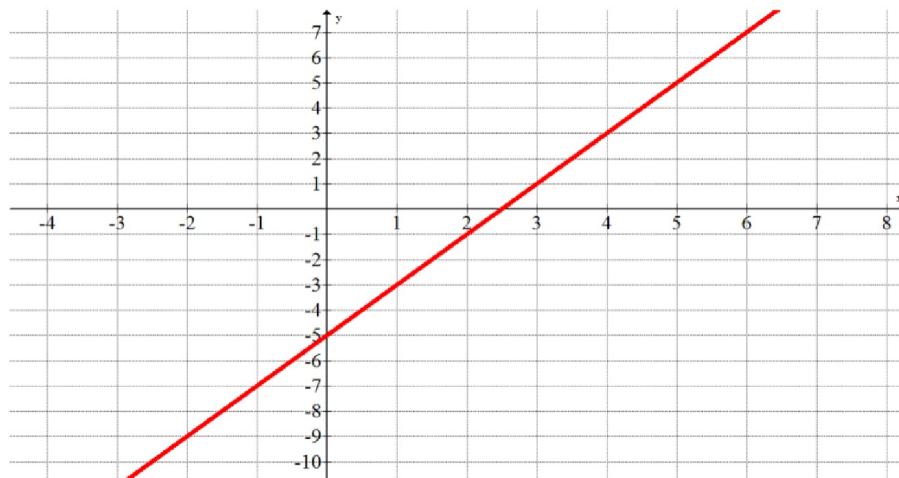| x	f(x)	f'(x)

$y = -4$ $f'(x) =$ _____

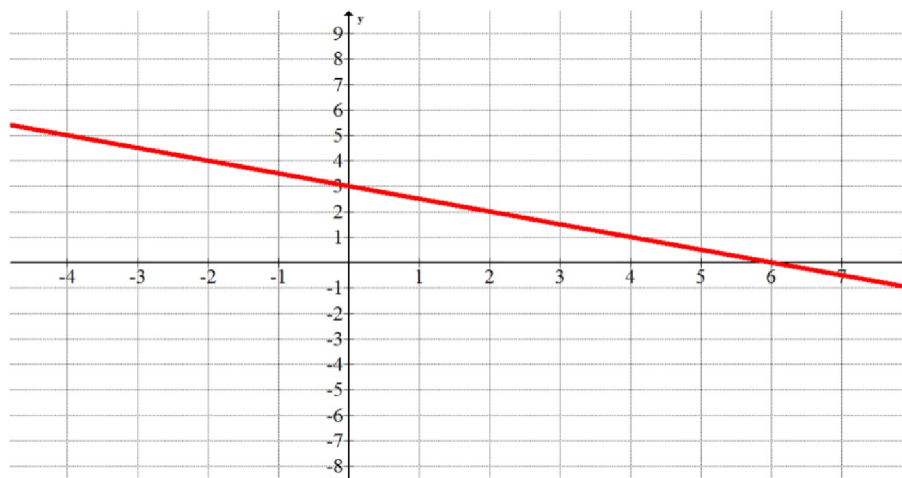| x	f(x)	f'(x)

B: Linear Functions

$f(x) = 2x - 5$ $f'(x) = $_____

x	f(x)	f'(x)

$f(x) = -0.5x + 3$ $f'(x) = $_____

x	f(x)	f'(x)

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C: Quadratic Functions

Complete the table using a graphing calculator or graphing software to generate values for f'(x). Then sketch f'(x).

$f(x) = x^2$ Link to Graph file.

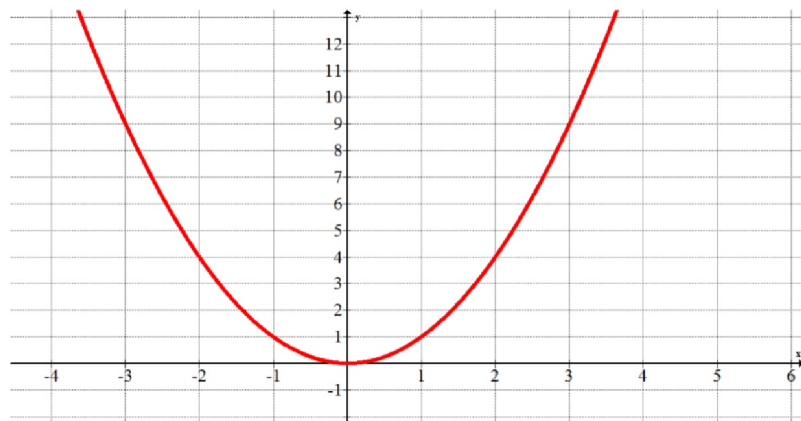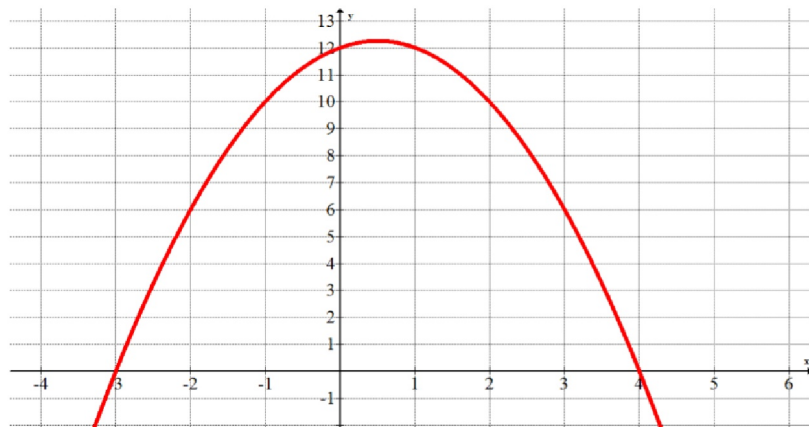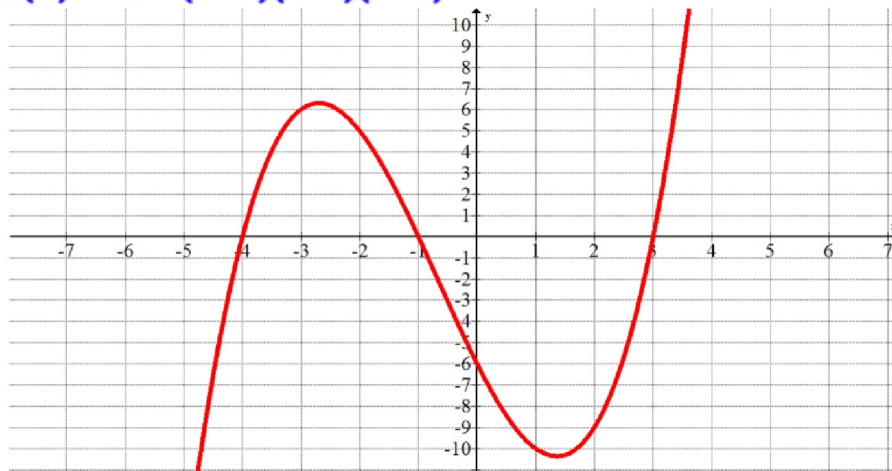| x	f(x)	f'(x)

$f(x) = -(x+3)(x-4)$ Link to Graph file.

x	f(x)	f'(x)

D: Cubic Functions

Complete the table using a graphing calculator or graphing software to generate values for f'(x).
Then sketch f'(x).

$f(x) = 0.5 (x+4)(x+1)(x-3)$

Link to Graph file.

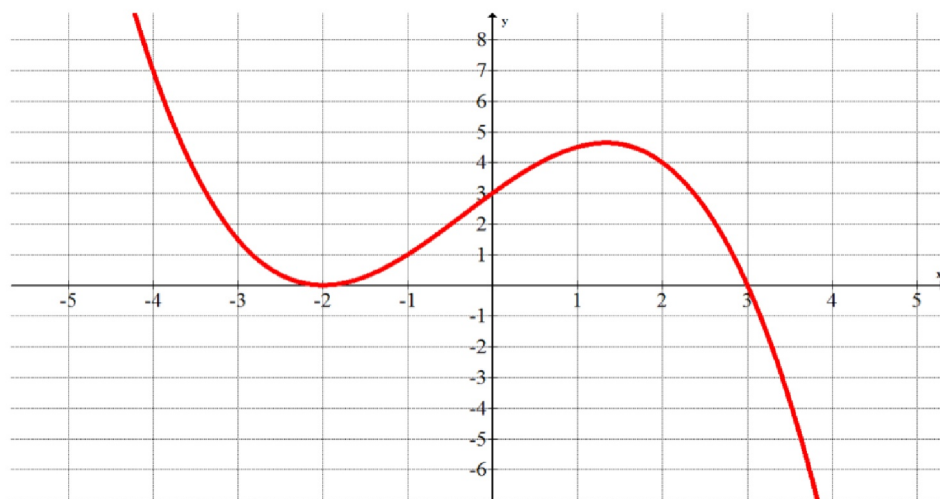| x	f(x)	f'(x)

$f(x) = - 0.25 (x+2)^2 (x-3)$

Link to Graph file.

x	f(x)	f'(x)

Summary:

> The derivative function of a:
> constant function is a _____ function.
> linear function is a _____ function.
> quadratic function is a _____ function.
> cubic function is a _____ function.

Homework: Handout

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