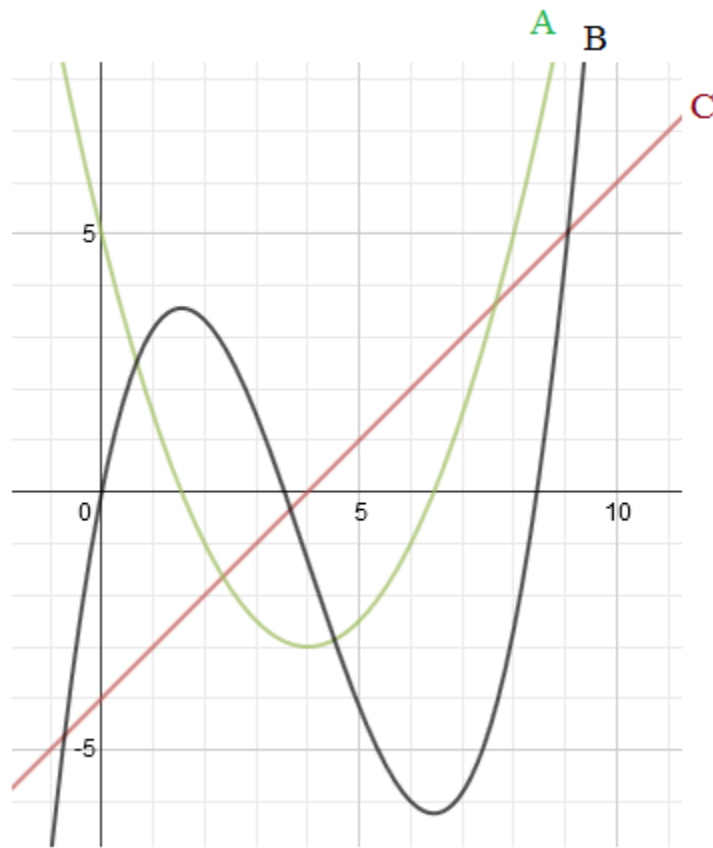# Calculus: Sketching Graphs (Antiderivatives) 2

Practice Test and solutions

Topics include slope, concavity, velocity, graphing, critical values, points of inflection, and more.

Method 1: Identify each graph

A is a parabola (quadratic with degree 2)

B is a cubic (with degree 3)

C is a line (linear with degree 1)

Since the derivative will <u>reduce each degree by 1</u>,

B is the function
A is the first derivative
C is the second derivative

Method 2: Identifying critical values: max/min of each
curve OR the x-intercepts

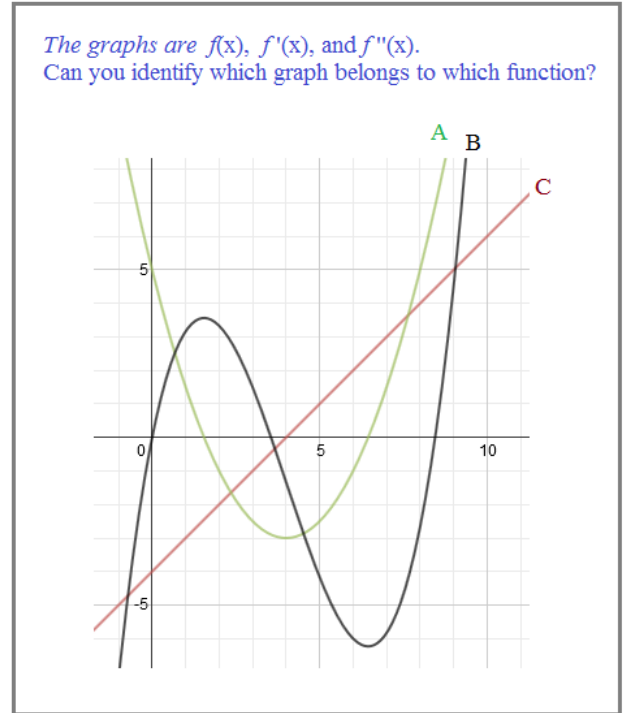Graph A has two zeros (x-intercepts): 1.5 and 6.5

Meanwhile, B has two critical values: relative maximum at x = 1.5
relative minimum at x = 6.5

Therefore, A is describing the behavior (slope) of B...

Then, C has a zero at x = 4. At the same time, A has a minimum at x = 4...

Therefore, C is describing the rate of change behavior of A...

B is the function...
A is the first derivative..
C is the second derivative..

Method 3: If possible, describe the graphs.

The graphs are f(x), f'(x), and f"(x).
Can you identify which graph belongs to which function?

A is a parabola:

vertex: (-4, -3)   y-intercept = (0, 5)

$$y = a(x + 4)^2 - 3$$

$$5 = a(0 + 4)^2 - 3$$

$$a = 1/2$$

$$1/2(x + 4)^2 - 3$$

$$\frac{1}{2}x^2 + 4x + 5$$

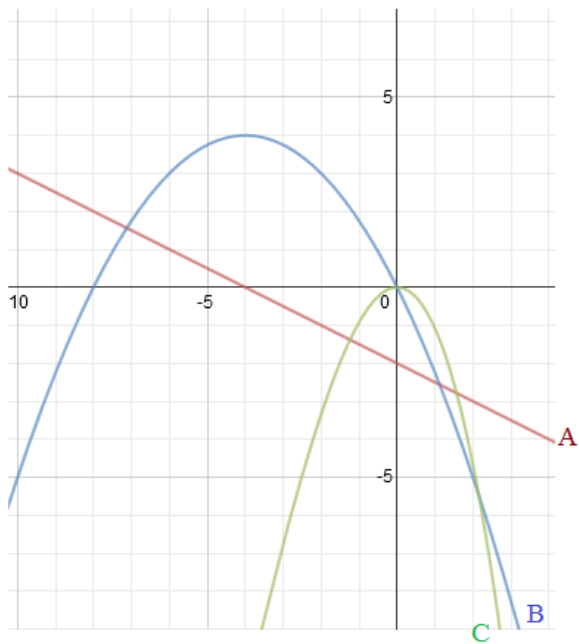C is a line:

slope = 1   y-intercept = (0, 4)

$$(x + 4)$$

C is the first derivative of A
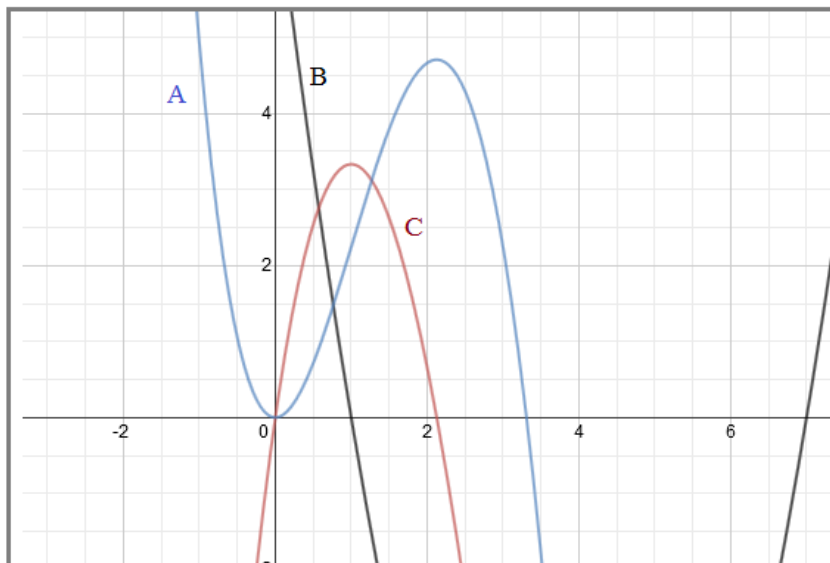
B is a cubic function: $\frac{1}{6}x^3 + 2x^2 + 5x + C$

B is the integral (antiderivative) of A

Two Practice Examples on the next page-→

The graphs are f(x), f'(x), and f''(x).
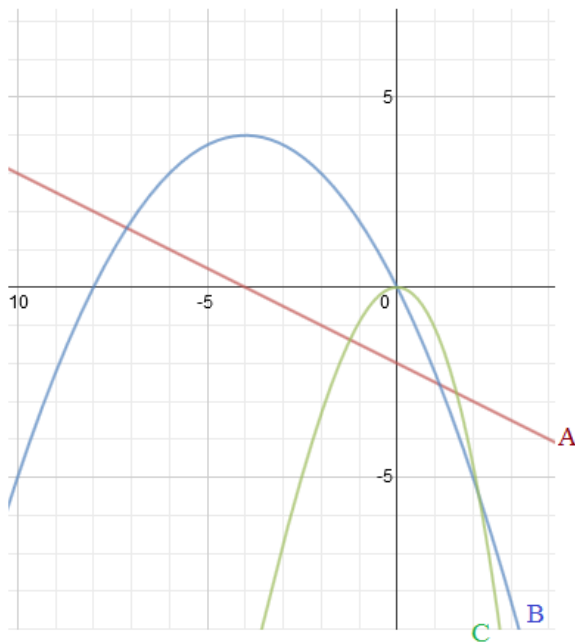Can you identify which graph belongs to which function?

The following is part of a graph showing the position, velocity, and acceleration of a particle.

Can you match s(t) , v(t) , and a(t) which the appropriate letters?

The graphs are f(x), f'(x), and f''(x).
Can you identify which graph belongs to which function?

Since A is a line (with the least degree), it is second derivative $f''(x)$

then, observe that C has a relative maximum at (0, 0)..
meanwhile, graph B goes from positive to negative at x = 0..
It's describing the behavior of C!!

C is $f(x)$

B is $f'(x)$

A is $f''(x)$

C: $\dfrac{-x^3}{12} - x^2$

B: $\dfrac{-x^2}{4} - 2x$

A: $\dfrac{-x}{2} - 2$

The following is part of a graph showing the position, velocity, and acceleration of a particle.
Can you match $s(t)$, $v(t)$, and $a(t)$ which the appropriate letters?

s(t)   position   function

v(t)   velocity   first derivative

a(t)   acceleration   second derivative

A has relative minimum at x = 0
   and relative maximum at x = 2.2

C has zeros at x = 0 and x = 2.2

C is the derivative of A (C is describing the behavior/slope of A)
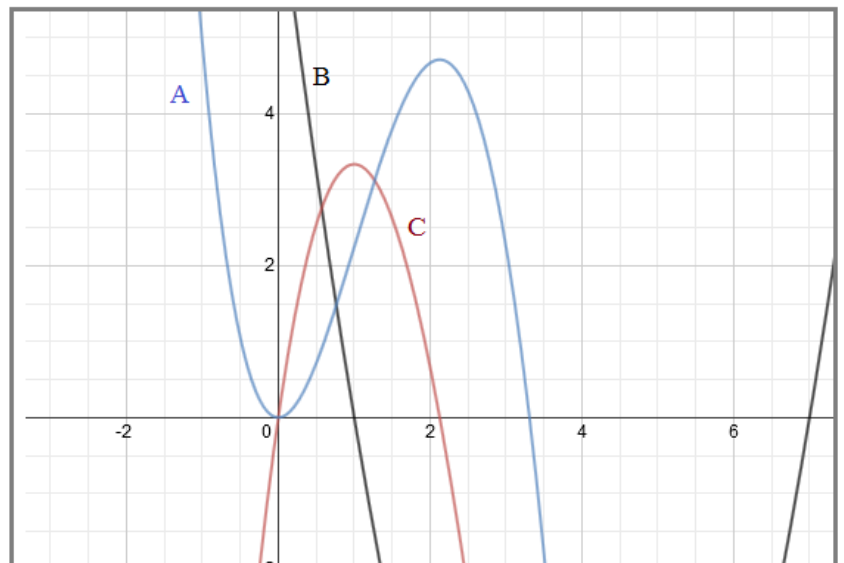
B has a zero at x = 1.
And, C has a relative maximum at x = 1.

B is the derivative of C (B is describing the behavior of C)

A is the position s(t)
C is the velocity   v(t)
B is the acceleration a(t)

Practice Questions -→

Graphing Calculus Functions
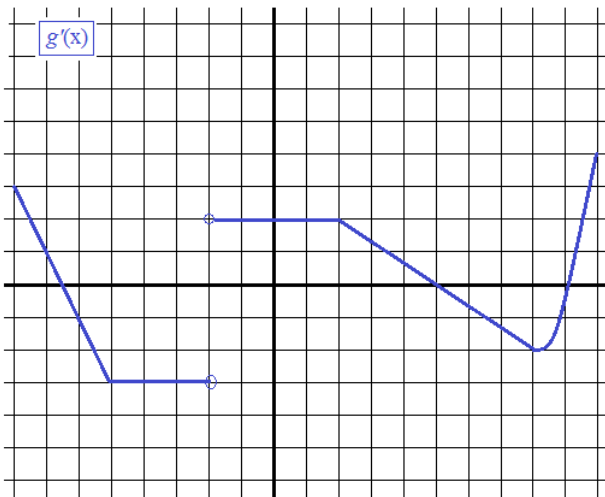
Part I:

f(x)

f'(x)

A) Graph $f'(x)$

B) Answer the following:
   1) $f(-7) =$

   2) $f'(-7) =$

   3) $f(1) =$

   4) $f'(1) =$

C) What interval(s) does $f(x)$ increase?

D) Where is $f(x) < 0$

E) Where is the function concave up? Concave down? Where do points of inflection exist?

Part II:

g'(x)

A) Identify the relative maximum(s).

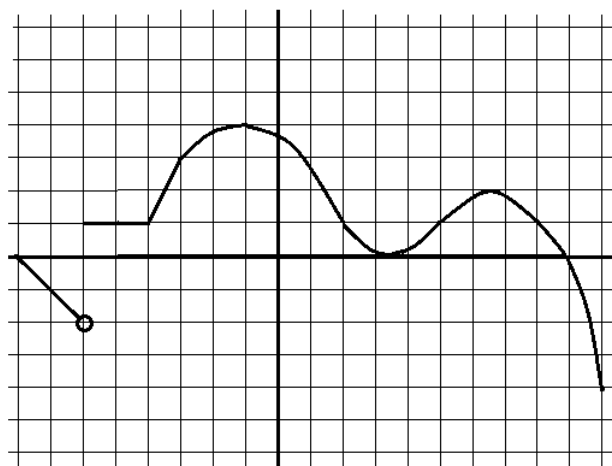B) What is the slope of $g(x)$ at $x = 1$?

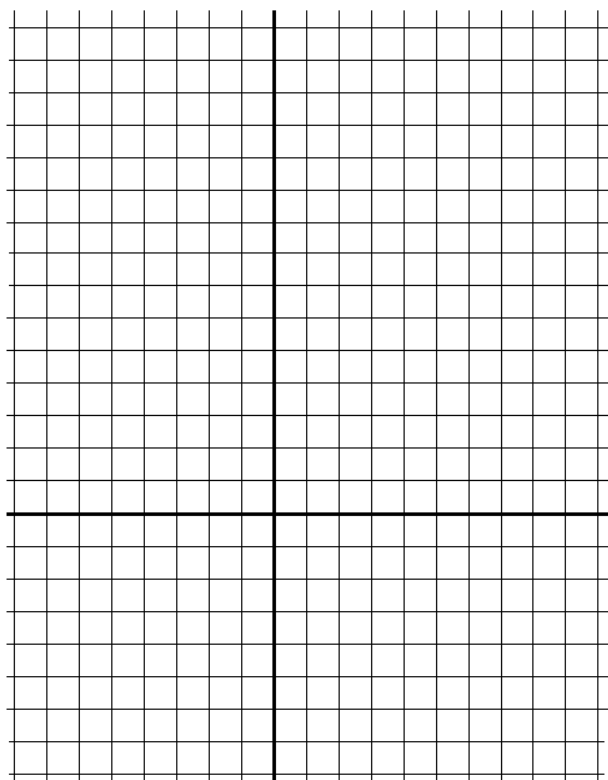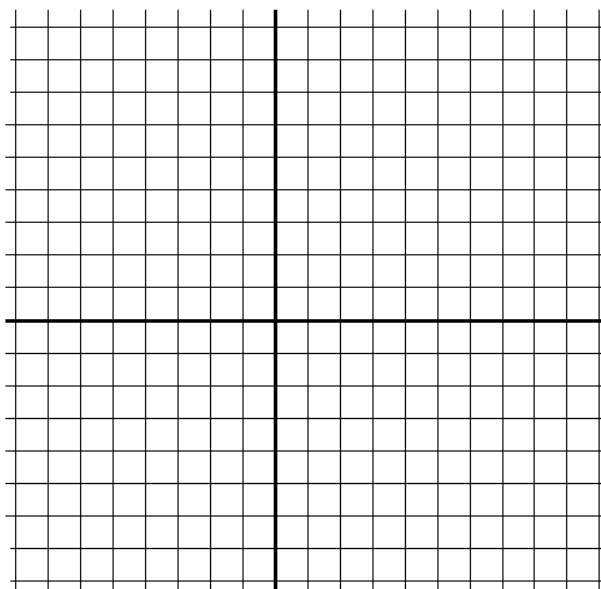C) Where is $g(x)$ concave down?

D) Sketch a graph of $g(x)$.

Part III:

The following is $f'(x)$ on the interval [-8, 10]

Graph $f''(x)$

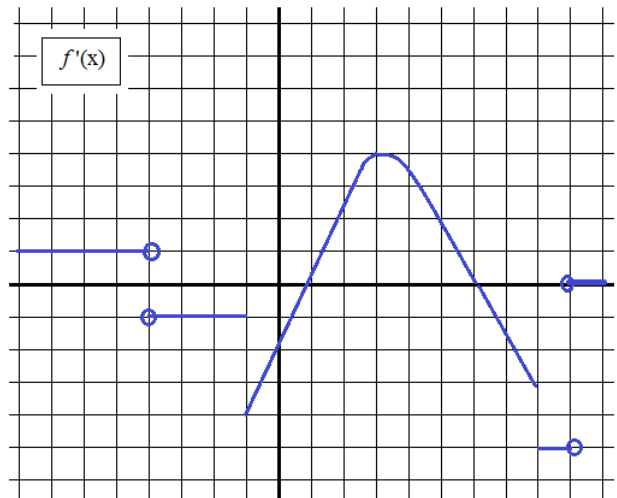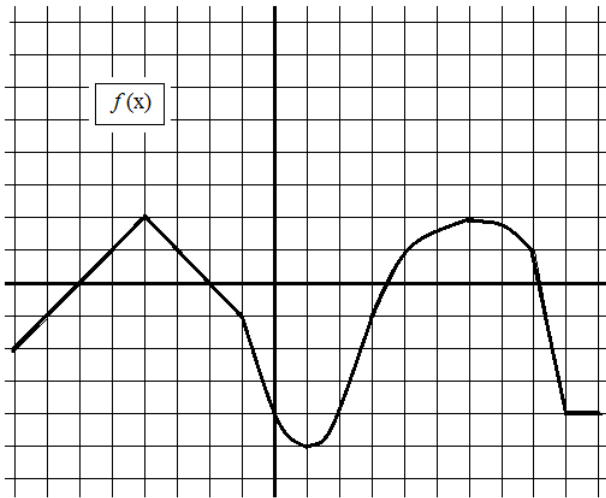Graph $f(x)$: (assume $f(-8) = -6$)

A) Where is the maximum of $f(x)$? $x =$

B) Identify the points of inflection.

C) On the interval [-5, 5], where is the slope of $f(x)$ steepest?

D) What is the instantaneous rate of change at x = -2 ?

E) If $f(-6) = Y$, what is $f(-4)$?

SOLUTIONS

Part I:

f(x)

f'(x)

A) Graph $f'(x)$

B) Answer the following: 1) $f(-7) =$ -1

The derivative of a function is the instantaneous rate of change at each point... So, $f'(x)$ represents the slope of $f(x)$

2) $f'(-7) =$ 1
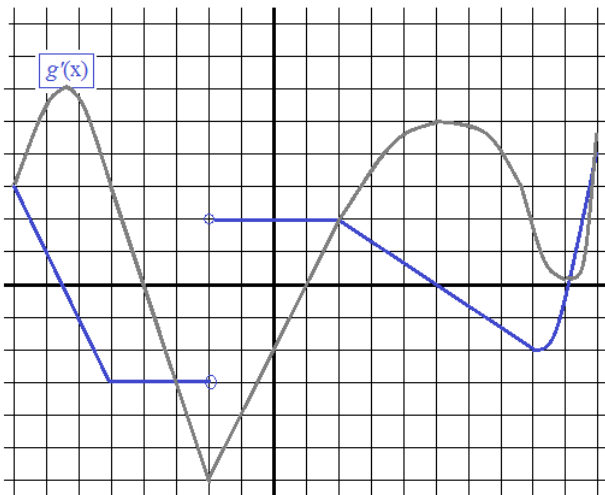
3) $f(1) =$ -5

4) $f'(1) =$ 0

C) What interval(s) does $f(x)$ increase?   [-8, -4) U (1, 6)

D) Where is $f(x) < 0$ [-8, -6)   (-2, 3.5)   (8.2, 10]

E) Where is the function concave up? Concave down? Where do points of inflection exist?

[-1, 3)   (3, 8]   x = 3

Part II:

g'(x)

A) Identify the relative maximum(s).

Relative max at x = -6.5 and x = 5

B) What is the slope of $g(x)$ at x = 1?

slope = $g'(1) = 2$

C) Where is $g(x)$ concave down?
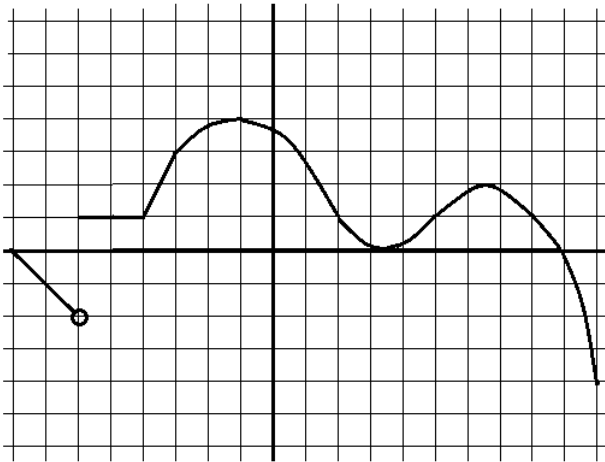
$g''(x) < 0$, so find where slope of $g'(x) < 0$

[-8, -5)   (2, 8]

D) Sketch a graph of $g(x)$.

SOLUTIONS

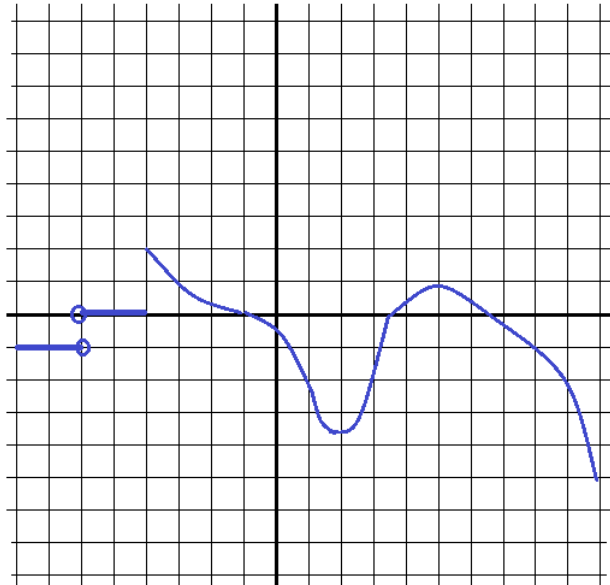Part III:

The following is $f'(x)$ on the interval [-8, 10]

Graph $f''(x)$

Graph $f(x)$:   (assume $f(-8) = -6$)
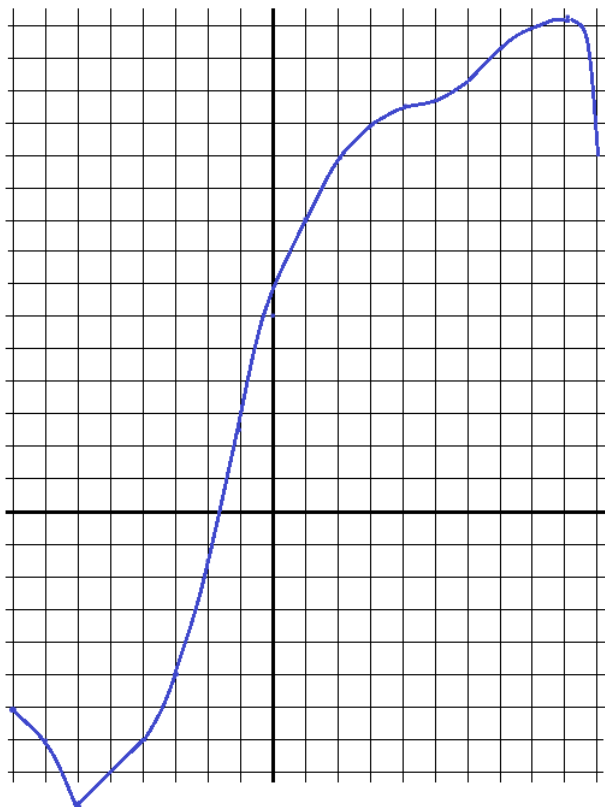

A) Where is the maximum of $f(x)$?   x = 9

B) Identify the points of inflection.

x = -1, 3.5, 6.5

C) On the interval [-5, 5], where is the slope of $f(x)$ steepest?

at x = -1

D) What is the instantaneous rate of change at x = -2 ?

3.75

E) If $f(-6) = Y$, what is $f(-4)$?

Since the instantaneous rate of change
(slope) from x = -6 to -4 is 1,

$f(-4) = Y + 2$

Thanks for visiting. (Hope it helped!)

Check out other calculus and math topics at the site.

If you have questions, suggestions, or requests, let us know.

Enjoy
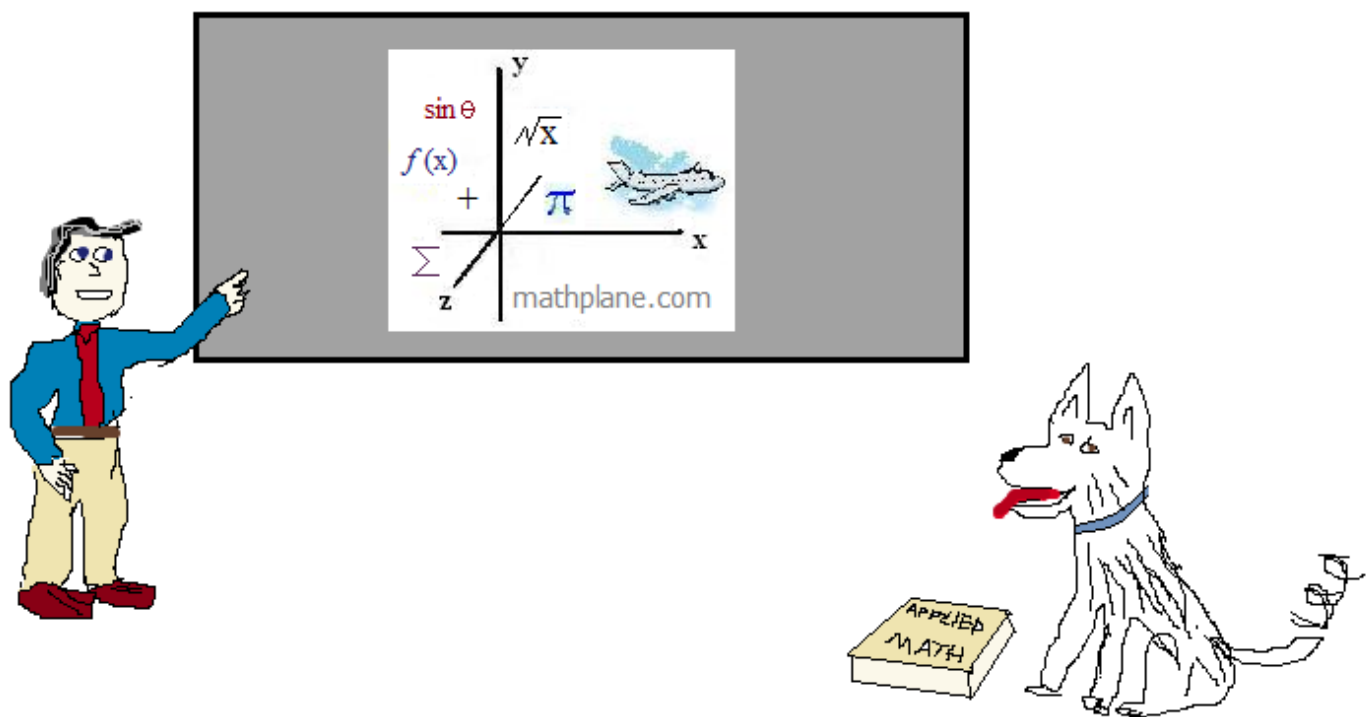
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