

3.3.1 What does f'' tell me?

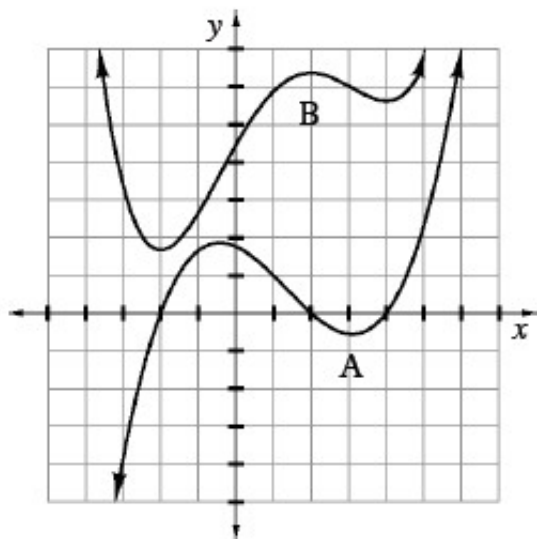
Curve Constructor: Part I



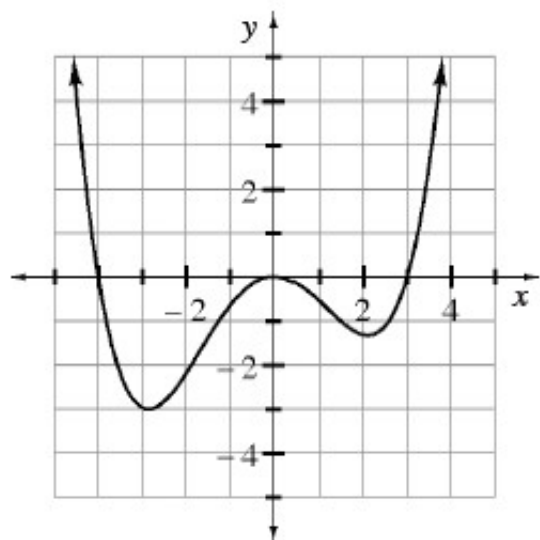
3-82. Knowing if a function increases or decreases tells us something, but not everything about its possible shape.

- Draw an example of a function that is increasing everywhere. What type of function behaves like this? Is there more than one possible shape?
- Draw an example of a function that is decreasing, then increasing, then decreasing again. What type of function behaves like this?
- Find a function that infinitely alternates between increasing and decreasing. What type of function behaves like this?

3-83. One of the functions below is $f(x)$ and the other is its slope function, $f'(x)$. Can you determine which function, A or B, is the slope function of the other? How do you know?



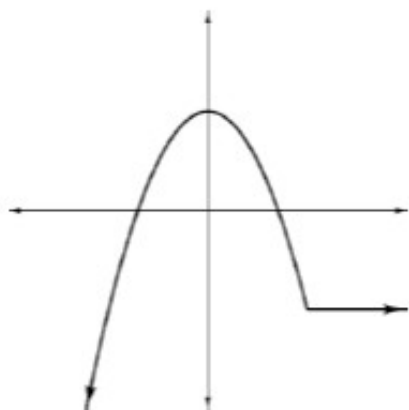
3-84. Using the graph of $f(x)$ below, answer the following questions:



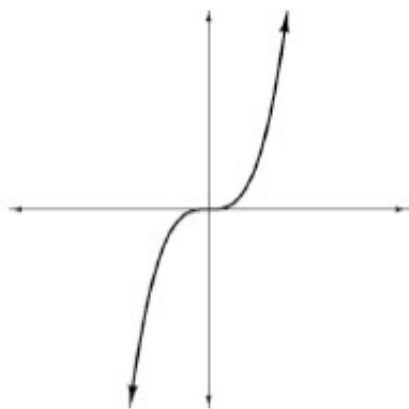
- At what values of x does $f(x)$ change from increasing to decreasing or decreasing to increasing? What is $f'(x)$ at these points?
- State the intervals where $f(x)$ is increasing. What is true about $f'(x)$ over these intervals?
- Using the information above, sketch the graph of $f'(x)$.

3-85. Sketch the slope function for each function below.

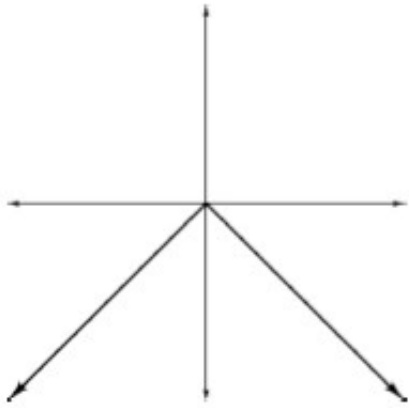
a.



b.



c.



d. What happens to the slope at a corner (called a cusp)?

3-86. CURVE CONSTRUCTOR, Part One

Computers often have drawing programs that allow a user to create pictures and diagrams. Your firm is designing software that will allow users to construct curves so they do not have to draw them free hand.

As the main software designer, you need to provide the user the option of drawing all different kinds of curves.



You have decided to create a button that will create an arc by clicking and dragging a mouse. The direction and size of the arc depends on where you click and where you drag the mouse. The user can use this button to create each part of a long, interesting curve.



- What are the different orientations of arcs that can be created? For at least four of these, give a sketch and describe with a slope statement.
- With this tool, you can create arcs of different sizes and orientations. Then multiple arcs can be connected to make one long continuous curve. Create a few long continuous curves that use all possible orientations of arcs.
- Using arcs with the orientations you gave in part (a), can you draw a close approximation to any long continuous curve?



3-87. Using the statement below, identify where the slope of the function is positive, negative, and zero.

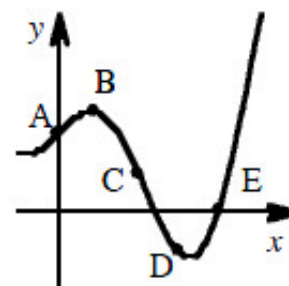
"The function increases from negative infinity until it reaches a peak at $x = -4$ then decreases until $x = 1$ where the graph turns and then increases until positive infinity." [Help \(Html5\)](#) \Leftrightarrow [Help \(Java\)](#)

3-88. Given $f(x)$ below, find $f'(x)$. [Help \(Html5\)](#) \Leftrightarrow [Help \(Java\)](#)

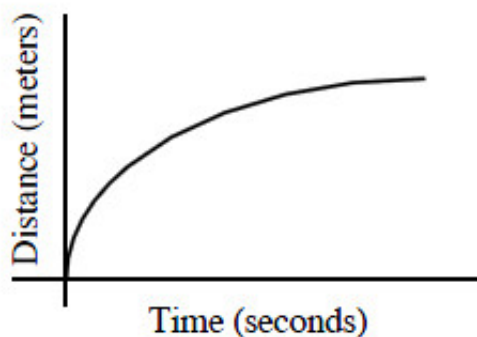
- a. $f(x) = -x$
- b. $f(x) = 0$
- c. $f(x) = \frac{1}{6}(x - 2)^3$
- d. $f(x) = 9x + \sin x$

3-89. Name all point(s) on the graph below which meet the given criteria: [Help \(Html5\)](#) \Leftrightarrow [Help \(Java\)](#)

- a. Slope of the tangent is most positive.
- b. Slope of the tangent is negative.
- c. Slope of the tangent is the most negative.



3-90. The graph below shows the distance from a fixed point traveled by a toy car. Use the graph to sketch the velocity of the car. [Help \(Html5\)](#) \Leftrightarrow [Help \(Java\)](#)



3-91. Sketch the function $f(x) = -2x^2 + 8x$. [Help \(Html5\)](#) \Leftrightarrow [Help \(Java\)](#)

- Estimate $A(f, 0 \leq x \leq 4)$ using four trapezoids.
- Write a Riemann sum representing $A(f, 0 \leq x \leq 4)$ using n left endpoint rectangles. Then, use the summation feature of your graphing calculator to evaluate. Compare the accuracy of the trapezoids and the rectangles.
- Will the approximation with trapezoids always equal the approximation with rectangles for all functions? Why or why not?

3-92. While using the definition of a derivative, Lulu used the following limit. For what function was she finding the derivative? How can you tell? Without simplifying this expression, determine the limit. [Help \(Html5\)](#) \Leftrightarrow [Help \(Java\)](#)

$$\lim_{h \rightarrow 0} \frac{(6(x+h)^2 - 5(x+h) + 3) - (6x^2 - 5x + 3)}{h}$$

3-93. If $f'(x) = 3x^2 + 2x - 5$, find a possible function for $f(x)$. Then find another possible function. [Help \(Html5\)](#) \Leftrightarrow [Help \(Java\)](#)

3-94. Show that if $f'(x)$ is an even function and $f(0) = 0$, then $f(x)$ is odd. Demonstrate this fact with a graph. [Help \(Html5\)](#) \Leftrightarrow [Help \(Java\)](#)

3-95. Evaluate each limit. If the limit does not exist, say so but also state if y is approaching positive or negative infinity. [Help \(Html5\)](#) \Leftrightarrow [Help \(Java\)](#)

a. $\lim_{x \rightarrow 0} \frac{x^2 + 3x - 10}{x - 2}$

b. $\lim_{x \rightarrow -5} \frac{x^2 + 3x - 10}{x - 2}$

c. $\lim_{x \rightarrow 2} \frac{x^2 + 3x - 10}{x - 2}$

d. $\lim_{x \rightarrow \infty} \frac{x^2 + 3x - 10}{x - 2}$

- e. Use the limits above to describe the shape of the graph of $y = \frac{x^2 + 3x - 10}{x - 2}$. State all horizontal asymptotes, vertical asymptotes and holes.