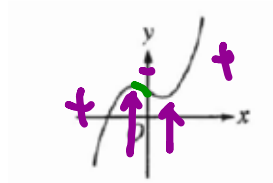


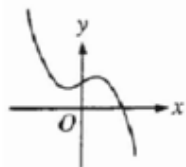
1. 1998 #6 (BC) - No Calc:



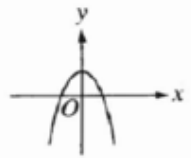
$h'(x)$

The graph of  $y = h(x)$  is shown above. Which of the following could be the graph of  $y = h'(x)$ ?

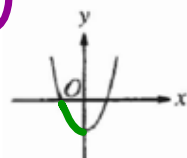
a.



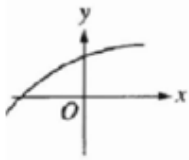
~~c.~~



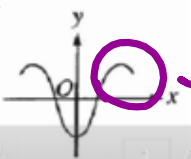
c.



b.



~~x~~



→

2. 1998 #1 (BC) - No Calc: What are all values of  $x$  for which the function  $f$  defined by  $f(x) = x^3 + 3x^2 - 9x + 7$  is increasing?

a.  $-3 < x < 1$

b.  $-1 < x < 1$

c.  $x < -3$  or  $x > 1$

d.  $x < -1$  or  $x > 3$

e. All real numbers

$f' = 3x^2 + 6x - 9 = 0$

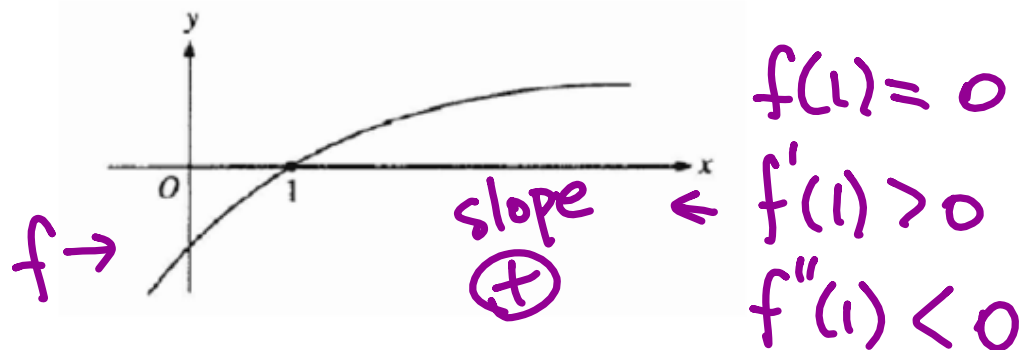
$3(x^2 + 2x - 3) = 0$

$3(x + 3)(x - 1) = 0$

$-3, 1$

$x = 0$   
 $f' < 0$

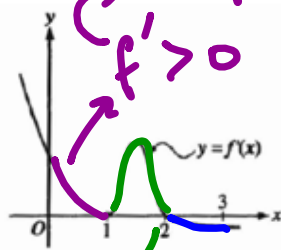
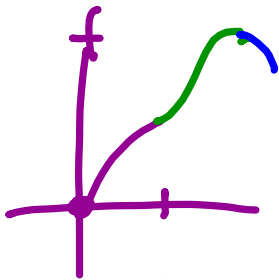
3. 1998 #17 (BC) - No Calc:



The graph of a twice-differentiable function  $f$  is shown in the figure above. Which of the following is true?

- a.  $f(1) < f'(1) < f''(1)$       c.  $f'(1) < f(1) < f''(1)$       e.  $f''(1) < f'(1) < f(1)$   
 b.  $f(1) < f''(1) < f'(1)$       **d.  $f''(1) < f(1) < f'(1)$**

4. 2003 #90 (BC) - Calc OK:



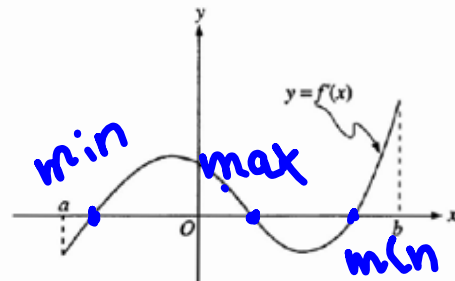
slope of  $f > 0$   
 $f' > 0$   
 $y = f'(x)$

The graph of  $f'$ , the derivative of the function  $f$ , is shown above. If  $f(0) = 0$ , which of the following must be true?

- i.  $f(0) > f(1)$
- ii.  $f(2) > f(1)$
- iii.  $f(1) > f(3)$

- a. I only
- b. II only
- c. III only
- d. I and II only
- e. II and III only

5. 1997 #12 (BC) - No Calc:



The graph of  $f'$ , the derivative of  $f$ , is shown in the figure above. Which of the following describes all relative extrema of  $f$  on the open interval  $(a, b)$ ?

- a. One relative maximum and two relative minima
- b. Two relative maxima and one relative minimum
- c. Three relative maxima and one relative minimum
- d. One relative maximum and three relative minima
- e. Three relative maxima and two relative minima

6. 1997 #3 (BC) - No Calc: The function  $f$  given by  $f(x) = 3x^5 - 4x^3 - 3x$  has a relative maximum at  $x =$

a.  $-1$

c.  $0$

e.  $1$

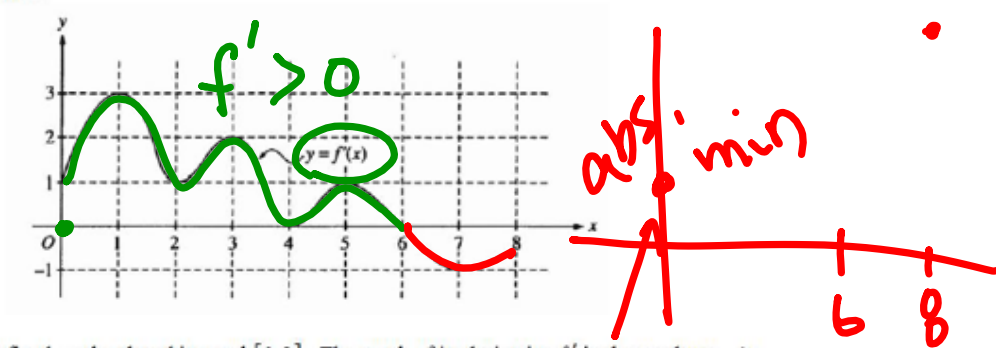
b.  $\frac{-\sqrt{5}}{5}$

d.  $\frac{\sqrt{5}}{5}$

$f' = 15x^4 - 12x^2 - 3 = 0$   
 $3(5x^4 - 4x^2 - 1) = 0$   
 $3(5x^2 + 1)(x^2 - 1)$   
 $3(5x^2 + 1)(x - 1)(x + 1) = 0$   
 $1, -1$

A sign chart for  $f'$  is shown to the left. The number line has tick marks for  $x = -1$  and  $x = 1$ . The sign of  $f'$  is positive for  $x < -1$ , negative for  $-1 < x < 1$ , and positive for  $x > 1$ . A purple circle is drawn around the region  $x < -1$ , with a purple arrow pointing to it labeled "r. max". A purple arrow points to the region  $-1 < x < 1$  labeled "r. mln". The value  $x = 0$  is marked on the number line.

7. 1997 #9 (BC) - No Calc:



The function  $f$  is defined on the closed interval  $[0, 8]$ . The graph of its derivative  $f'$  is shown above. At what value of  $x$  does the absolute minimum of  $f$  occur?

- a. 0      b. 2      c. 4      d. 6      e. 8