Working with Graphs of $f'(x)$ and $f''(x)$

~~**Increasing and Decreasing Functions**~~ **Name:** Answers

AP Calculus

1) Let f be the function with derivative given by $f'(x) = x^2 - \frac{2}{x}$. On which of the following intervals is f decreasing?

(A) $(-\infty, -1]$ only

(B) $(-\infty, 0)$

(C) $[-1, 0)$ only

(D) $(0, \sqrt[3]{2}]$

(E) $[\sqrt[3]{2}, \infty)$

C.P.: $f'(x) = 0$ or when $f'(x)$ is undef

$x^2 - \frac{2}{x} = 0$

$x^3 - 2 = 0$

$x = \sqrt[3]{2}$

$f'(x)$: $-$ at 1, $+$ at 10; tick marks at 0, $\sqrt[3]{2}$, 10

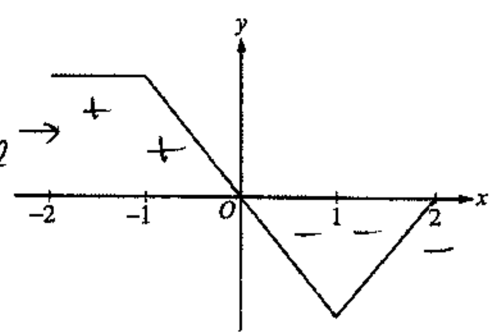
+ $x = 0$ is a c.p. since $f'(0)$ is undef.

$f'(x)$: $+$ | 0 | $-$ | $\sqrt[3]{2}$ | $+$

0 C.P. $\qquad \sqrt[3]{2}$ C.P.

2)

$f(x)$ has + slope →



← $f(x)$ has neg. slope

Graph of f'

The graph of f', the derivative of the function f, is shown above. Which of the following statements is true about f ?

(A) f is decreasing for $-1 \le x \le 1$.

(B) f is increasing for $-2 \le x \le 0$. ✓

(C) f is increasing for $1 \le x \le 2$.

(D) f has a local minimum at $x = 0$.

(E) f is not differentiable at $x = -1$ and $x = 1$.

3)

x	0	1	2	3
$f''(x)$	5	0	-7	4

The polynomial function f has selected values of its second derivative f'' given in the table above. Which of the following statements must be true?

(A) f is increasing on the interval $(0, 2)$. need $f'(x)$

(B) f is decreasing on the interval $(0, 2)$. need $f'(x)$.

(C) f has a local maximum at $x = 1$. need $f'(x)$

(D) The graph of f has a point of inflection at $x = 1$. perhaps, but we don't have all the data to know for sure

(E) The graph of f changes concavity in the interval $(0, 2)$.

This must be true since $f''(0) = +$ and $f''(2) = -$

4) The first derivative of the function f is defined by $f'(x) = \sin(x^3 - x)$ for $0 \le x \le 2$. On what interval(s) is f increasing?

Note: This requires a calculator.

(A) $1 \le x \le 1.445$

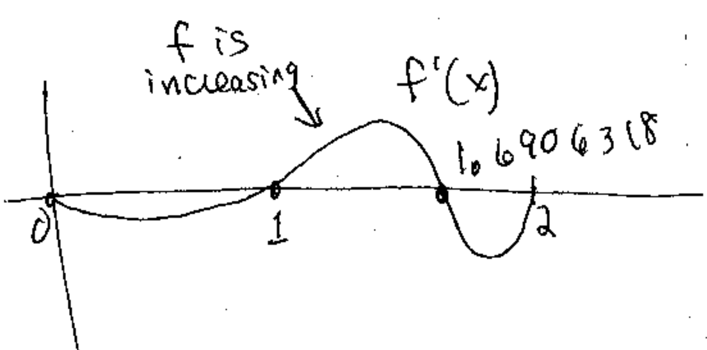
(B) $1 \le x \le 1.691$

(C) $1.445 \le x \le 1.875$

(D) $0.577 \le x \le 1.445$ and $1.875 \le x \le 2$

(E) $0 \le x \le 1$ and $1.691 \le x \le 2$

Graph the derivative + find where $f'(x) = 0$. These are the c.p. of the original function $f(x)$. $f(x)$ is increasing when $f'(x) > 0$.



$y_1 = \sin(x^3 - x)$
$y_2 = 0$