1.

x	$0 < x < 3$	$x = 3$	$3 < x < 9$	$x = 9$	$9 < x < 11$	$x = 11$	$11 < x < 16$
$f'(x)$	Positive	Undefined	Negative	-3	Negative	0	Positive
$f''(x)$	Positive	Undefined	Negative	0	Positive	0	Positive

The function f is continuous on the interval $(0, 16)$, and f is twice differentiable except at $x = 3$, where the derivatives are undefined. Information about the first and second derivatives of f for values of x in the interval $(0, 16)$ is given in the table above. At what values of x in the interval $(0, 16)$ does the graph of f have a point of inflection?

changes $f''(x)$ sign

$x = 3$
$x = 9$

(A) $x = 9$ only

(B) $x = 3$ and $x = 9$

(C) $x = 3$ and $x = 11$

(D) $x = 9$ and $x = 11$

2. Let f be the function defined by $f(x) = \frac{1}{3}x^3 - 3x^2 - 16x$. On which of the following intervals is the graph of f both decreasing and concave down?

(A) $(-\infty, 3)$ X

(B) $(-2, 3)$ only

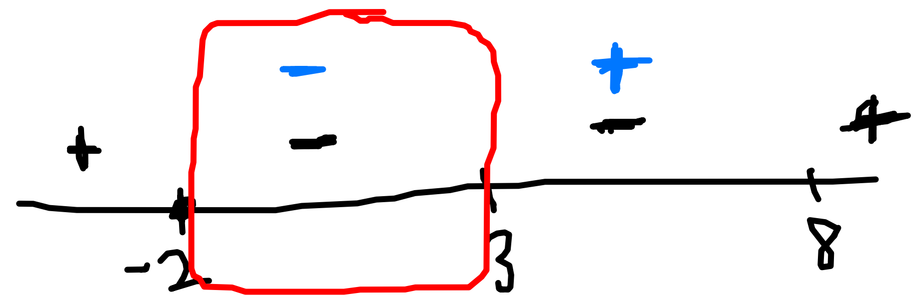
(C) $(3, 8)$

(D) $(8, \infty)$ X

$f'(x) < 0$ decreasing

$f''(x) < 0$ concave down

$f'(x)$



$f'(x) = x^2 - 6x - 16$

$f'(-2) = -2^2 - 6(-2) - 16$

$4 + 12 - 16$

$f(-3) = 9 + 18 - 16$

11

$*f''(x) = 2x - 6$

3. The first derivative of the function h is given by $h'(x) = \sin x + \cos(x^2) + x$, and the second derivative of h is given by $h''(x) = \cos x - 2x\sin(x^2) + 1$. On what open intervals contained in $-3 < x < 2$ is the graph of h both increasing and concave down?

Look for....

$h'(x) > 0$ increasing

$h''(x) < 0$ concave down

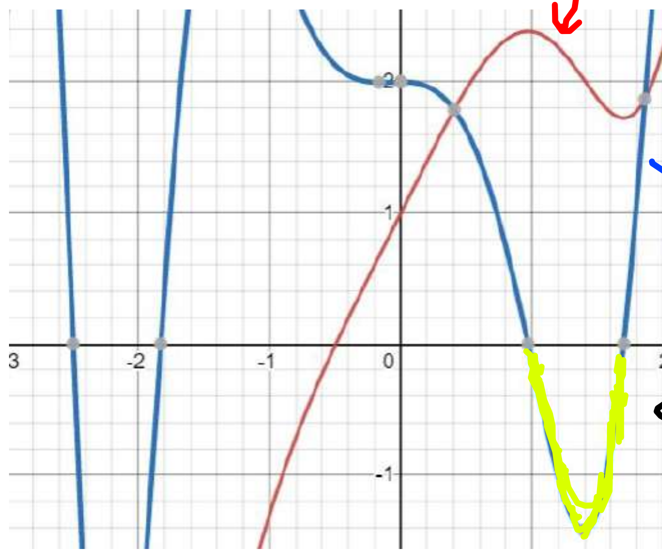
✓ (A) $(0.969, 1.697)$ only

(B) $(-2.499, -1.829)$ and $(0.969, 1.697)$

(C) $(-0.495, 2)$

(D) $(-1.311, -0.166)$

$h'(x)$



$h''(x)$

Here is the interval when both conditions are met