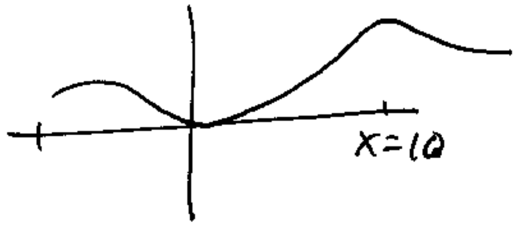
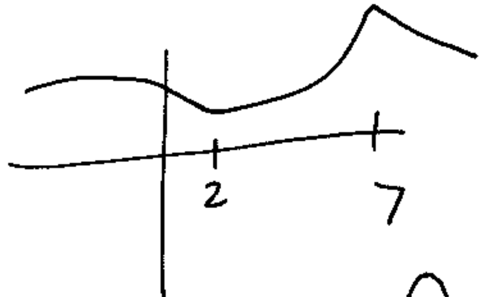
Section 6.1 # 3, 4, 7, 12, 13, 21, 36, 39 $\boxed{\text{Set \#17}}$

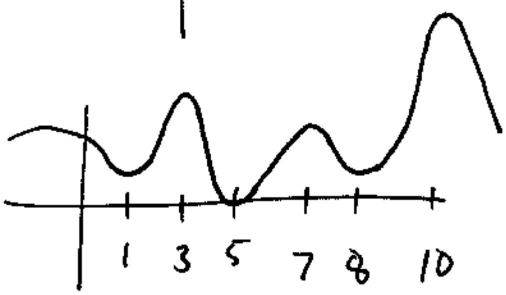
3a.)



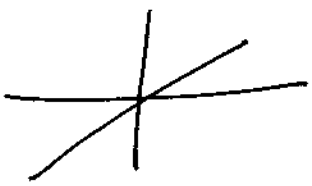
b.)



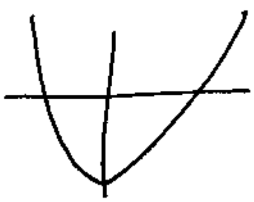
c.)



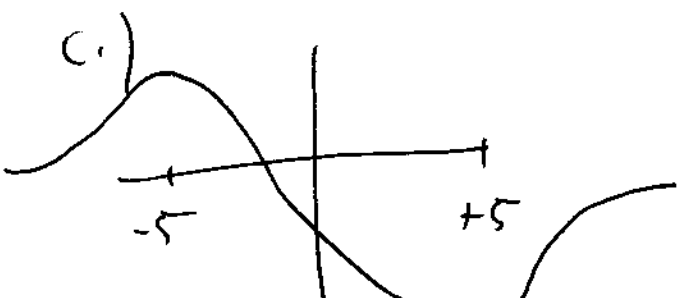
4a.)



b.)



c.)



(7) $f(x) = (x-1)^3 \quad [0,4]$

$f' = 3(x-1)^2$

$f' = 0$ at $x = 1$

$f'' = 6(x-1)$

$f''(1) = 0$, inconclusive

Trying endpts. gives

$\boxed{\text{Max at } x = 4 \quad \text{Min at } x = 0}$

(12) $f = \sin x - \cos x \quad [0, \pi]$

$f' = \cos x + \sin x$

$f'(3\pi/4) = 0$

$f'' = \cos x - \sin x$

$f''(3\pi/4) = \cancel{4\pi}$ neg. $\boxed{\text{Max at } x = \frac{3\pi}{4}}$

endpt. $\boxed{x = 0 \text{ min}}$

(13) $f(x) = 1 + |9 - x^2| \quad [-5, 1]$

$f = 1 + x^2 - 9 \quad [-5, -3]$

$= 1 + 9 - x^2 \quad [-3, 1]$

$f' = 2x \quad [-5, -3]$

$f' = -2x \quad [-3, 1]$

$f' = 0$ at $x = 0$, $f'' = -$ at $x = 0$, so max

Check endpts & $x = -3$ (non-diff pt). Min $x = -3$

21 $\dfrac{x^2}{x+1}$ $(-5,-1)$

$$f' = \frac{2x(x+1) - x^2}{(x+1)^2}$$

$$= \frac{x^2+2x}{(x+1)^2}$$

$x^2 + 2x = 0$

$x(x+2) = 0$

$x = 0, -2 \leftarrow$ within range

$$f'' = \frac{(2x+2)(x+1)^2 - 2(x+1)(x^2+2x)}{(x+1)^4}$$

$\boxed{f''(-2) = \text{negative, so max; no min}}$

36 $f = x^2 + px + q$

$f' = 2x + p$

$f'(1) = 0 \longrightarrow p = -2$

$f(1) = 3$ so $q = 4$

$\boxed{f = x^2 - 2x + 4}$

and since

$f'' = 2$, $\boxed{f(1) \text{ is a min}}$

39 ~~absolute max.~~

~~$\sin x - x$ $[0, 2\pi]$~~

~~$f' = \cos x - 1$~~

~~$f' = 0$ at $x = 0, 2\pi$~~

absolute min

$f = x - \sin x$

$f' = 1 - \cos x = 0$ at $x = 0, 2\pi$

$f'' = 1$, so $x = 0, 2\pi$ are mins.

$f(0) = f(2\pi) = 0$ = nonnegative

so we've proved the inequality