Section 11.1 Solutions 39, 41, 51

39] $f(x) = x^3 - 3x + 5$

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

$f'(x) = 0$ at $x = -1, 1$

Intervals	$(x+1)(x-1)$	
$(-\infty, -1)$	$- \cdot - = +$	increasing
$(-1, 1)$	$+ \cdot - = -$	decreasing
$(1, \infty)$	$+ \cdot + = +$	increasing

$f(-1) = -1 + 3 + 5 = 7$

$f(1) = 1 - 3 + 5 = 3$

Max at $(-1, 7)$ Min at $(1, 3)$

41] $f(x) = -3x^3 - 9x^2 + 72x + 20$

$f'(x) = -9x^2 - 18x + 72 = -9(x^2 + 2x - 8) = -9(x+4)(x-2)$

$f'(x) = 0$ at $x = -4, 2$

$f(-4) = 192 - 144 - 288 + 20 = -220$

$f(2) = -24 - 36 + 144 + 20 = 104$

Intervals	$-(x+4)(x-2)$			
$(-\infty, -4)$	$-$	$-$	$= -$	decreasing
$(-4, 2)$	$-$	$+$	$= +$	↑
$(2, \infty)$	$-$	$+$	$= -$	↓

Min at $(-4, -220)$ Max at $(2, 104)$

51] $f(x) = x^3 - 3x + 1$ $\quad f(0) = 1$

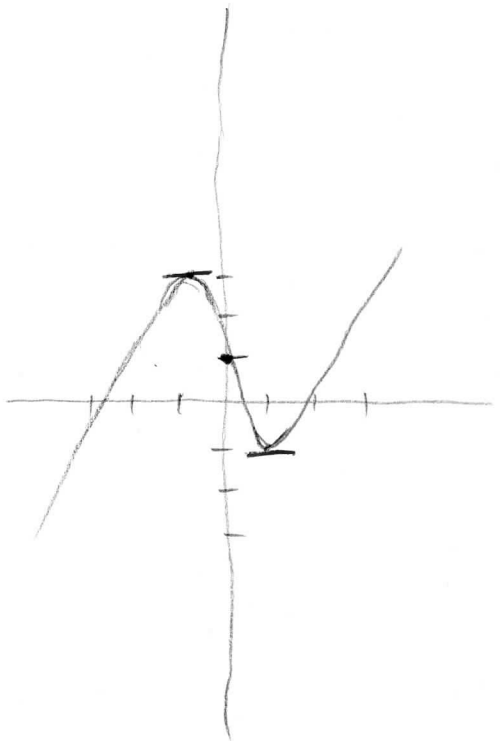
$f'(x) = 3x^2 - 3 = 3(x^2 - 1) = 3(x+1)(x-1)$

$f'(x) = 0$ at $x = -1, 1$ $\quad f(-1) = -1 + 3 + 1 = 3$

$f(1) = 1 - 3 + 1 = -1$

x		-1		0		1	
$f(x)$		3		1		-1	
$f'(x)$	$+++$	0	$---$		$---$	0	$+++$
		Max				Min	

See prob 39



Section 11.1 Solution

#47] $f(x) = (x^2-4)^{2/3}$

$$f'(x) = \frac{2}{3}(x^2-4)^{-1/3}(2x) = \frac{4x}{3(x^2-4)^{1/3}}$$

$f'(x) = ND$ at $x = -2, 2$ $\qquad f(-2) = f(2) = 0$

$= 0$ at $x = 0$ $\qquad f(0) = 2\sqrt[3]{2}$

Intervals	$4x$	$(x^2-4)^{1/3}$		
$(-\infty, -2)$	$-$	$+$	$= ---$	decreasing ↓
$(-2, 0)$	$-$	$-$	$= +++$	↑ Min
$(0, 2)$	$+$	$-$	$= ---$	↓ Max
$(2, \infty)$	$+$	$+$	$= +++$	↑ Min

Minimums at $(-2, 0)$, $(2, 0)$

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