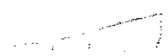
125 HW #8

4.2 7, 17

4.3 6, 9ab, 38ab

4.2 #7 on $[0,8]$, MVT says there is some c

with $f'(c) = \dfrac{f(8)-f(0)}{8-0} = \dfrac{6-4}{8} = \dfrac{2}{8} = \dfrac{1}{4}$

This is a slope like , which seems

to happen at $c \approx .9, 3.1, 4.4, 6.1$

4.2 #17 $f(x) = 1 + 2x + x^3 + 4x^5$

$f(0) = 1$

$f(-1) = 1-2-1-4 < 0$

So by IVT, $f(x)$ has a root.

Also, $f'(x) = 2 + 3x^2 + 20x^4$

is always positive (even powers)

So $f(x)$ is always increasing, so cannot

have more than 1 root.

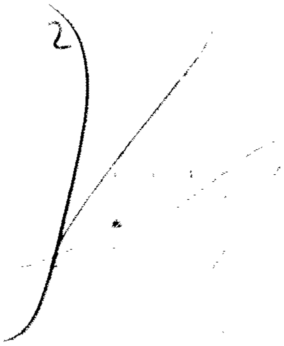
(Or, say that 2 roots means we get 2

points a, b with $f(a) = 0$ and $f(b) = 0$,

so $f(a) = f(b)$. Then by Rolle,

there is a pt with $f'(x) = 0$, which

is a contradiction.)



4.3 #6a

$f'(x) > 0$ on $[0,1)$, $(3,5)$

so f is increasing there

$f'(x) < 0$ so f is decreasing on $(1,3)$ and $(5,6]$

4.3 #9ab

$f(x) = 2x^3 + 3x^2 - 36x$

$f'(x) = 6x^2 + 6x - 36$

crit pts: $6x^2 + 6x - 36 = 0 \implies x^2 + x - 6 = 0$

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

$x = 2$ or -3.

		-3		2	
f':	$+$		$-$		$+$
	$f'(-4) > 0$		$f'(0) < 0$		$f'(3) > 0$

a) So f is inc. on $(-\infty, -3)$ and $(2, \infty)$

f is dec. on $(-3, 2)$

b) $f(-3)$ is a local maximum

$f(2)$ is a local minimum.

4.3 #38ab $\qquad G(x) = x - 4\sqrt{x}$

$$G'(x) = 1 - 2x^{-1/2} = 1 - 2\frac{1}{\sqrt{x}}$$

crit. pts: $\quad 1 - 2x^{-1/2} = 0$

$1 = 2x^{-1/2}$

$\frac{1}{2} = x^{-1/2}$

$\frac{1}{4} = x^{-1}$

$x = 4$

f': $\quad 0 \qquad 4$

$\qquad - \qquad +$

$f'(1) < 0 \qquad f'(9) > 0$

Also, $G'(x)$ DNE at $x = 0$
or $x < 0$

a) So G is decreasing on $(0, 4)$
" " increasing " $(4, \infty)$

b) $G(4)$ is a local minimum.

($G(0)$ is also a local max, since
$G(0) = 0$, and then G decreases)