Sec 4.3 page 279 (2, 3, 5-8, 13, 19, 20, 21-25 odd)

(2) a) CU $(0,2)$
b) cd $(2,4)$ $(4,6)$
c) IP $(2,3)$

(3) a) Use increasing/decreasing test
b) Use concavity
c) where concavity changes we have IP's $(x, f(x))$

(5) a) $x=3$ and $x=5$
b) $x=2$, $x=4$, $x=6$
c) $x=1$, $x=7$

(6) a) $(2,4)$, $(6,9)$
b) L max $x=4$
L min $x=2$ and $x=6$
c) CU $(1,3)$ $(5,7)$ $(8,9)$
CD $(0,1)$ $(3,5)$ $(7,8)$
d) $x=1,3,5,7,8$

(7) $f(x)=2x^3+3x^2-36x$
a) $f'=6x^2+6x-36$
$f'=6(x^2+x-6)$
$f'=6(x+3)(x-2)$
$x=-3, 2$

	$x+3$	$x-2$	f'	f
$(-\infty,-3)$	−	−	+	↑
$(-3,2)$	+	−	−	↓
$(2,\infty)$	+	+	+	↑

(7) b) Lmax $f(-3)=81$

Lmin $f(2)=-44$

c) $f''=12x+6$

$12x+6>0$ $\therefore$ CU $(-\frac{1}{2},\infty)$

$x>-\frac{1}{2}$ CD $(-\infty,-\frac{1}{2})$

IP at $f(-\frac{1}{2})=\frac{37}{2}$

(8) $f(x)=4x^3+3x^2-6x+1$

a) $f'(x)=12x^2+6x-6$

$f'(x)=6(2x^2+x-1)$

$f'(x)=6(2x-1)(x+1)$

$x=\frac{1}{2}$ or -1

	$(2x-1)$	$x+1$	f'	f
$(-\infty,-1)$	−	−	+	↑
$(-1,\frac{1}{2})$	−	+	−	↓
$(\frac{1}{2},\infty)$	+	+	+	↑

b) Local max $f(-1)=6$

Local min $f(\frac{1}{2})=-\frac{3}{4}$

c) $f''=24x+6$ $\therefore$ CU $(-\frac{1}{4},\infty)$

$x>0$ when $x>-\frac{1}{4}$ CD $(-\infty,-\frac{1}{4})$

IP at $f(-\frac{1}{4})=\frac{21}{8}$

(13) $f(x)=e^{2x}+e^{-x}$ $\therefore$ ↑ $(-\frac{1}{3}\ln 2,\infty)$

$f'(x)=2e^{2x}-e^{-x}$ ↓ $(-\infty,-\frac{1}{3}\ln 2)$

$f'=0$ when

$\ln 2e^{2x}=\ln e^{-x}$

$\ln 2+2x\ln e=-x$

$\frac{\ln 2}{-3}=x$

(13) b) Local min only at $(-\frac{1}{3}\ln 2, 1.89)$

c) $f'' = 4e^{2x} + e^{-x}$ $\therefore$ CU $(-\infty, \infty)$

both are always +

$(+) + (+) = +$

(19) a) $f' = 0$ $f'' = -$

means Local max or min and since f'' − CD means max. $\therefore$ Local max at $x = 2$.

b) There is not enough information. The second derivative test fails.

(20) a) $f'(x) = 4x^3(x-1)^3 + 3x^4(x-1)^2$

$f'(x) = x^3(x-1)^2(4(x-1) + 3x)$

$f'(x) = x^3(x-1)^2(4x - 4 + 3x)$

$f'(x) = x^3(x-1)^2(7x-4)$

C# are $0, 1, 4/7$

(21) $f(x) = 2x^3 - 3x^2 - 12x$

a) $f' = 6x^2 - 6x - 12$

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

$f' = 6(x-2)(x+1)$

$x = -1, 2$

	$x-2$	$x+1$	f'	f
$(-\infty, -1)$	−	−	+	↑
$(-1, 2)$	−	+	−	↓
$(2, \infty)$	+	+	+	↑

b) Local max $f(-1) = 7$

Local min $f(2) = -20$

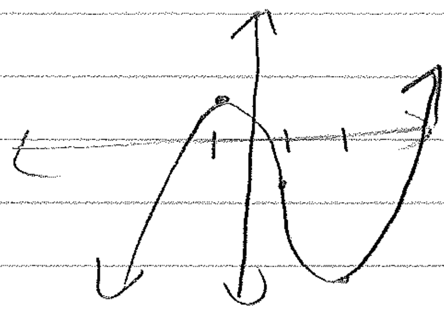
c) $f''(x) = 12x - 6$ $\quad \therefore$ CU $(1/2, \infty)$

$12x - 6 > 0$ $\quad$ CD $(-\infty, 1/2)$

$x > 1/2$

IP $f(1/2) = -13/2$

d)



(23) $f(x) = 2 + 2x^2 - x^4$

$f' = 4x - 4x^3$

$f' = 4x(1 - x^2)$

$f' = 4x(1-x)(1+x)$

$x = 0, 1, -1$

	$4x$	$1-x$	$1+x$	f'	f
$(-\infty, -1)$	−	+	−	+	↑
$(-1, 0)$	−	+	+	−	↓
$(0, 1)$	+	+	+	+	↑
$(1, \infty)$	+	−	+	−	↓

b) Local max $f(-1) = 3$ $\quad f(1) = 3$

Local min $f(0) = 2$

c) $f'' = 4 - 12x^2$

$= 4(1 - 3x^2)$

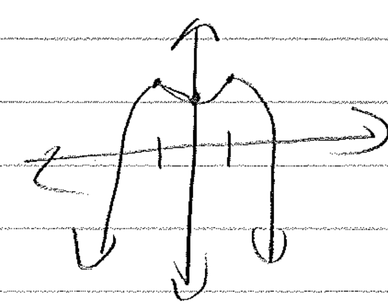
$= 4(1 - \sqrt{3}x)(1 + \sqrt{3}x)$

$x = -1/\sqrt{3}, 1/\sqrt{3}$

	$(1-\sqrt{3}x)$	$1+\sqrt{3}x$	f''	f
$(-\infty, -1/\sqrt{3})$	+	−	−	CD
$(-1/\sqrt{3}, 1/\sqrt{3})$	+	+	+	CU
$(1/\sqrt{3}, \infty)$	−	+	−	CD

IP $f(-1/\sqrt{3}) = 23/9$

$f(1/\sqrt{3}) = 23/9$



(25) $h(x) = (x+1)^5 - 5x - 2$

a) $h'(x) = 5(x+1)^4 - 5$

$5(x+1)^4 = 5$

$(x+1)^4 = 1$

which means $x+1 = 1$ or $x+1 = -1$

so $x = 0$ or $x = -2$

$(-\infty, -2)$ increasing

$(-2, 0)$ decreasing

$(0, \infty)$ increasing

b) local max $f(-2) = 7$

local min $f(0) = -1$

c) $f'' = 20(x+1)^3$ $\therefore (-\infty, -1)$ CD IP $f(-1) = 3$

$x = -1$ $(-1, \infty)$ CU

d)