1. (a) $f(x) = \dfrac{2x^3}{2x^3+5x^2-12x}$; $f(x) = \dfrac{2x^3}{x(2x-3)(x+4)}$

VA: $x=0$, $x=3/2$, $x=-4$

HA $y = 2/2 = 1$

(b) $f(x) = \dfrac{-x^2}{(2x-1)(x+5)}$; $f(x) = \dfrac{-x^2}{2x^2+9x-5}$

VA $x = 1/2$, $x=-5$

HA $y = -1/2$

(a) $f(x) = x^3 - 27x + 30$

$f'(x) = 3x^2 - 27$

$3(x^2 - 9) = 0$

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

$3, -3$

	$3(x-3)(x+3)$			y'	
$(-\infty, -3)$	+	−	−	+	inc
$(-3, 3)$	+	−	+	−	Dec
$(3, \infty)$	+	+	+	+	inc

$x = -3 \quad y = 84$ max

$x = 3 \quad y = -24$ min

(b) $y = (x-2)^8(x+1)^4$

$y' = (x-2)^8 4(x+1)^3 + (x+1)^4 8(x-2)^7$

$y' = 4(x-2)^8(x+1)^3 + 8(x-2)^7(x+1)^4$

$4(x-2)^7(x+1)^3((x-2) + 2(x+1))$

$4(x-2)^7(x+1)^3(x - 2 + 2x + 2)$

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

$y' = 12x(x-2)^7(x+1)^3$

$x = 0, 2, -1$

	$12x(x-2)^7(x+1)^3$			y'	
$(-\infty, -1)$	−	−	−	−	dec
$(-1, 0)$	−	−	+	+	inc
$(0, 2)$	+	−	+	−	dec
$(2, \infty)$	+	+	+	+	inc

$x = -1 \quad y = 0$ min

$x = 0 \quad y = 256$ max

$x = 2 \quad y = 0$ min

3. (a) $f(x) = x^4 - 8x^3 - 192x^2 + 90x + 150$

$f'(x) = 4x^3 - 24x^2 - 384x + 90$

$f''(x) = 12x^2 - 48x - 384$

$12(x^2 - 4x - 32) = 0$

$12(x-8)(x+4) = 0$

$x = 8, -4$

	$12(x-8)(x+4)$			y''	
$(-\infty, -4)$	+	−	−	+	CU
$(-4, 8)$	+	−	+	−	CD
$(8, \infty)$	+	+	+	+	CU

Points of Inf:

$x = -4 \quad y = -2514 \quad (-4, -2514)$

$x = 8 \quad y = -11418 \quad (8, -11418)$

2(b) $y = \frac{1}{2}x^3 - \frac{24}{x}$

$y = \frac{1}{2}x^3 - 24x^{-1}$

$y' = \frac{3}{2}x^2 + 24x^{-2}$

$y'' = 3x - 48x^{-3}$

$3x^{-3}(x^4 - 16) = 0$

$3x^{-3}(x^2 - 4)(x^2 + 4) = 0$

$3x^{-3}(x-2)(x+2)(x^2+4) = 0$

$x = 0, 2, -2$

	$\frac{3}{x^3}(x-2)(x+2)(x^2+4)$	y''
$(-\infty, -2)$	$- \; - \; - \; +$	$-CD$
$(-2, 0)$	$- \; - \; + \; +$	$+CU$
$(0, 2)$	$+ \; - \; + \; +$	$-CD$
$(2, \infty)$	$+ \; + \; + \; +$	$+CU$

Pts of Inf

$x = -2 \quad y = 8 \quad (-2, 8)$

$x = 0 \quad$ undef.

$x = 2 \quad y = -8 \quad (2, -8)$

4. (a) $y = x^3 - 6x^2 + 16$; $y' = 3x^2 - 12x$; $y'' = 6x - 12$

A. $x \in R$

B. Interupts

(x) $(x-2)(x^2-4x-8)$

$x = 2$, $\frac{4 \pm \sqrt{48}}{2} = -1.46, 5.46$

(y) $y = 16$

C. Asymptotes —

D. Inc/Dec $3x^2 - 12x = 0$

$3x(x-4) = 0$

$0, 4$

	$3x$	$(x-4)$	y'
$(-\infty, 0)$	−	−	+ Inc
$(0, 4)$	+	−	− Dec
$(4, \infty)$	+	+	+ Inc

E. max / min

$x = 0$ $y = 16$ max

$x = 4$ $y = -16$ min

F. Concavity $6x - 12 = 0$

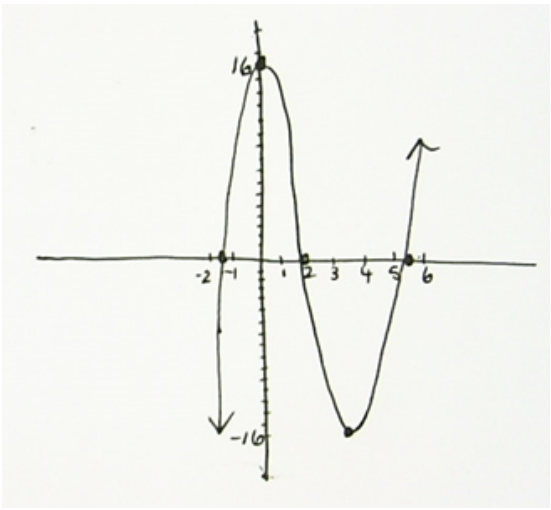
$6(x-2) = 0$

$x = 2$

	$6(x-2)$	y''	
$(-\infty, 2)$	+	−	CD
$(2, \infty)$	+	+	+ CU

Point(s) of Inf:

$x = 2$ $y = 0$ $(2, 0)$



(b) $y = \frac{2x^2-8}{x^2-1}$; $y' = \frac{12x}{(x^2-1)^2}$; $y'' = \frac{-36x^2-12}{(x^2-1)^3}$

A) $x \neq -1, 1$

B) Intercepts

x: $y = \frac{2(x-2)(x+2)}{(x^2-1)}$, $x = 2, x = -2$

y: $y = \frac{-8}{-1} = 8$

(C) Asymptotes: VA $x = 1, -1$

HA $y = 2$

D) Inc/Dec $\frac{12x}{(x^2-1)^2} = 0$

$x = 0, 1, -1$

	$12x/(x^2-1)^2$	y'
$(-\infty, -1)$	$-/+$	$-$ dec
$(-1, 0)$	$-/+$	$-$ dec
$(0, 1)$	$+/+$	$+$ inc
$(1, \infty)$	$+/+$	$+$ inc

$y = \frac{2x^2-8}{x^2-1}$

Behaviour

-1.1	-0.9	0.9	1.1
$-$	$=$	$=$	$+$
$-\infty$	$+8.9$	8.9	$-\infty$

E) max/Min $x = 0$ $y = 8$ $(0, 8)$

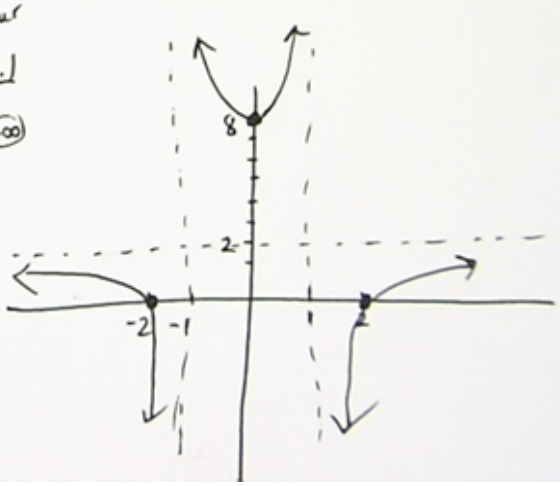
$x = -1$, $x = 1$ } undefined

F) Concavity $\frac{-36x^2-12}{(x^2-1)^3} = 0$ ← no zeros

$x = 1, -1$

	$-36x^2-12/(x^2-1)^3$	y''
$(-\infty, -1)$	$-/+$	$-$ CD
$(-1, 1)$	$-/-$	$+$ CU
$(1, \infty)$	$-/+$	$-$ CD

No points of inflection



C) $y = \frac{4-8x}{1+x}$, $y' = \frac{-12}{(1+x)^2}$, $y'' = \frac{24}{(1+x)^3}$

A) $x \neq -1$

B) x-int $x = \frac{1}{2}$ y-int 4

C) Asymptote VA $x = -1$
HA $y = -8$

D) Inc/Dec $\frac{-12}{(1+x)^2} = 0$ ← no zero
$\rightarrow x = -1$

	$\frac{-12}{(1+x)^2}$	
$(-\infty, -1)$	−/+	− dec
$(-1, \infty)$	−/+	− dec

E) No max/min

F) Concavity $\frac{24}{(1+x)^3} = 0$ ← no zero
← −1

	$\frac{24}{(1+x)^3}$	y''
$(-\infty, -1)$	+/−	− CD
$(-1, \infty)$	+/+	+ CU

No pt. of Inflection $y = \frac{4-8x}{1+x}$

Behavior

	−1.1	−0.9
	+/−	+/+
	−∞	+∞