1.(a) $f(x) = \frac{3x^3}{2x^3-x^2-5x-2}$; $f(x) = \frac{3x^3}{(2x+1)(x+1)(x-2)}$ VA: $x = -\frac{1}{2}, -1, 2$ HA $y = \frac{3}{2}$

(b) $f(x) = \frac{8}{(3x-1)^2}$; $f(x) = \frac{8}{9x^2-6x+1}$ VA $x = \frac{1}{3}$ HA $y = 0$

(c) $f(x) = \frac{3}{x^3} + 7$ VA: $x = 0$ HA $y = 7$

2.(a) $f(x) = 8x^3 + 15x^2 - 36x - 7$

$f'(x) = 24x^2 + 30x - 36$

$6(4x^2 - 5x - 6) = 0$

$6(4x+3)(x-2) = 0$

$x = -\frac{3}{4}, +2$

	$6(4x+3)(x-2)$	y'
$(-\infty, -\frac{3}{4})$	+ − −	+ inc
$(-\frac{3}{4}, 2)$	+ + −	− dec
$(2, \infty)$	+ + +	+ inc

$x = -\frac{3}{4}$ $y = 25.0625$ max

$x = 2$ $y = 45$ min

(b) $f(x) = (2x-9)^4(x+3)^8$

$f'(x) = (2x-9)^4 8(x+3)^7 + (x+3)^8 4(2x-9)^3 \cdot 2$

$8(2x-9)^4(x+3)^7 + 8(2x-9)^3(x+3)^8 = 0$

$8(2x-9)^3(x+3)^7[(2x-9) + (x+3)] = 0$

$8(2x-9)^3(x+3)^7(3x-6) = 0$

$x = \frac{9}{2}, x = -3, x = 2$

4.5,

	$8(2x-9)^3(x+3)^7(3x-6)$	y'
$(-\infty, -3)$	+ − − −	− dec
$(-3, 2)$	+ − + −	+ inc
$(2, 4.5)$	+ − + +	− dec
$(4.5, \infty)$	+ + + +	+ inc

$x = -3$ $y = 0$

$x = 2$ $y = 244140625$

$x = 4.5$ $y = 0$

3 (a) $y = x^6 - 240x^2$

$y' = 6x^5 - 480x$

$y'' = 30x^4 - 480$

$30(x^4 - 16) = 0$

$30(x^2 - 4)(x^2 + 4) = 0$

$30(x-2)(x+2)(x^2+4) = 0$

$x = 2, -2,$

	$30(x-2)(x+2)(x^2+4)$	y''	
$(-\infty, -2)$	+	+	CU
$(-2, 2)$	−	−	CD
$(2, \infty)$	+	+	CU

$x = -2 \quad y = -896 \quad (-2, -896)$

$x = 2 \quad y = -896 \quad (2, -896)$

pts of Inf

(b) $f(x) = \frac{1}{x} - \frac{6}{x^3}$

$f(x) = x^{-1} - 6x^{-3}$

$f'(x) = -1x^{-2} + 18x^{-4}$

$f''(x) = 2x^{-3} - 72x^{-5}$

$\frac{2}{x^3} - \frac{72}{x^5} = 0$

$\frac{2x^2}{x^5} - \frac{72}{x^5} = 0$

$\frac{2x^2 - 72}{x^5} = 0$

$\frac{2(x^2 - 36)}{x^5} = 0$

$\frac{2(x-6)(x+6)}{x^5} = 0$

$x = 6, -6, 0$

	$\frac{2(x-6)(x+6)}{x^5}$	y''	
$(-\infty, -6)$	+	−	CD
$(-6, 0)$	+	+	CU
$(0, 6)$	+	−	CD
$(6, \infty)$	+	+	CU

$x = -6 \quad y = -5/36$

$x = 0$ VA

$x = 6 \quad y = -5/36$

pts of Inf

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

$y = (x-2)(x^2 - 4x - 8)$ $y' = 3x(x-4) = 0$ $y'' = 6(x-2)$

A) Domain: $x \in R$

B) Intercepts:

x	y
2, 5.46, -1.46	16

(C) No asymptotes

(D) Inc/Dec $3x(x-4) = 0$

$x = 0, 4$

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

E) max/min

$x = 0$ $y = 16$ max

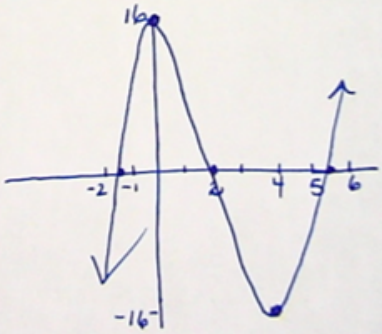
$x = 4$ $y = -16$ min

F) Concavity $6(x-2) = 0$

$x = 2$

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

G) Inflection $x = 2$ $y = 0$



(b) $y = \frac{3x^2-18}{x^2-9}$; $y' = \frac{-18x}{(x^2-9)^2}$; $y'' = \frac{54x^2+162}{(x^2-9)^3}$

A) Domain $x \neq 3, -3$

B) Intercepts:

x	y
2.45, -2.45	2

C) Asym: VA $x = 3, -3$
HA $y = 3$

(F) Concavity $\frac{54x^2+162}{(x^2-9)^3} = 0$

$x = 3, -3$

	$54x^2+162$	$(x^2-9)^3$	y''	
$(-\infty, -3)$	+	+	+	CU
$(-3, 3)$	+	−	−	CD
$(3, \infty)$	+	+	+	CU

D) Inc/Dec $\frac{-18x}{(x^2-9)^2} = 0$

$x = 0, 3, -3$

	$-18x$	$(x^2-9)^2$	y'	
$(-\infty, -3)$	+	+	+	Inc
$(-3, 0)$	+	+	+	Inc
$(0, 3)$	−	+	−	Dec
$(3, \infty)$	−	+	−	Dec

G) No Inf. Pts

Behaviour

$x = -3$

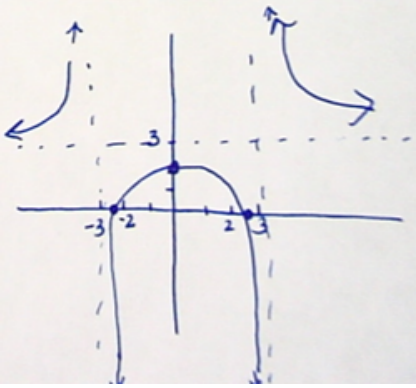
-3.1	-2.9
+	−
$+\infty$	$-\infty$

$x = 3$

2.9	3.1
−	+
$-\infty$	$+\infty$

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

$x = 3$
$x = -3$ } VAs



(C) $y = \frac{6+2x}{3-x}$; $y' = \frac{12}{(3-x)^2}$; $y'' = \frac{24}{(3-x)^3}$

A) Domain $x \neq 3$

B) Intercepts: x y
$x=-3$ $y=2$

(C) Asymptotes: VA $x=3$
HA $y=-2$

D) Inc/Dec $\frac{12}{(3-x)^2} = 0$
$x=3$

	$\frac{12}{(3-x)^2}$	y'
$(-\infty, 3)$	$+/+$	$+$ Inc
$(3, \infty)$	$+/+$	$+$ Inc

(E) No max/min

(F) Concavity $\frac{24}{(3-x)^3} = 0$
$x=3$

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

(G) No Pts. of Inf
$x=3$

Behaviour

2.9	3.1
$+/+$	$+/-$
$+\infty$	$-\infty$