1. Draw neat sketches of the following functions and relations.
Show all important features of the graphs. State also the domain and range.

(a) $x = 3$	(b) $y = -1$	(c) $y = 2x - 4$
(d) $3x + 4y - 12 = 0$	(e) $y = -x^2$	(f) $y = 2x^2 + 1$
(g) $y = 9 - x^2$	(h) $y = (x - 2)^2$	(i) $y = -(x + 1)^2$
(j) $y = (x - 2)(x - 4)$	(k) $y = x^2 - x - 6$	(l) $y = 8 + 2x - x^2$
(m) $y = (x + 3)^2 + 1$	(n) $y = 4 - (x - 5)^2$	(o) $y = -x^3$

(p) $y = 3 + 2x^3$

(q) $y = x^8$

(r) $y = -x^9$

(s) $x^2 + y^2 = 16$

(t) $x^2 + (y - 3)^2 = 4$

(u) $(x - 1)^2 + (y + 2)^2 = 1$

(v) $x^2 + y^2 + 8x - 6y - 11 = 0$

(w) $x^2 + y^2 - 2x = 0$

(x) $9x^2 + 9y^2 + 9x + 6y + 1 = 0$

(y) $y = 3^x$

(z) $y = -4^{-x}$

(aa) $y = 1 - 2^{-x}$

(bb) $y = -\frac{3}{x}$

(cc) $xy = 8$

GRAPHS WITH RESTRICTED DOMAIN AND PIECE MEAL FUNCTIONS:

2.

Sketch each function over the stated domain. State also the range of the function over the specified domain.

(a) $y = 3 - 2x, \quad x \geq 1$

(b) $y = x^2, \quad 0 \leq x \leq 2$

(c) $xy = 6, \quad -2 < x \leq 3, \quad x \neq 0$

(d) $y = (x+2)^2 - 1, \quad -3 \leq x \leq 0$

3.

Sketch each of the following piecemeal functions, showing the coordinates of the endpoints of each interval. State also the range of the function over the specified domain.

(a) $f(x) = \begin{cases} x+1 & \text{if} \quad x < 0 \\ -x+1 & \text{if} \quad x \geq 0 \end{cases}$

(b) $f(x) = \begin{cases} 2x+1 & \text{if} \quad x < 1 \\ 3 & \text{if} \quad x \geq 1 \end{cases}$

(c) $f(x) = \begin{cases} -2-x & \text{if} \quad x \leq 2 \\ 2x-3 & \text{if} \quad x > 2 \end{cases}$

(d) $f(x) = \begin{cases} x^2+1 & \text{if} \quad x < 0 \\ 1-x & \text{if} \quad x \geq 0 \end{cases}$

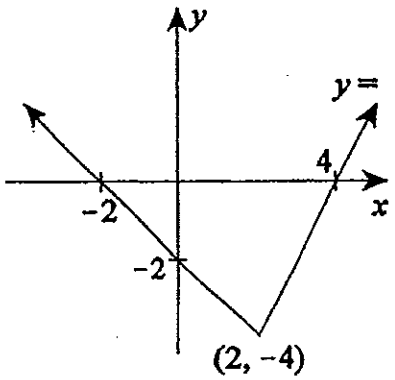
(e) $f(x) = \begin{cases} -x^2 & \text{if} \quad x < 1 \\ 2^x & \text{if} \quad x > 1 \end{cases}$

(f) $f(x) = \begin{cases} -2x - 3 & \text{for} \quad x < -1 \\ -1 & \text{for} \quad -1 \leq x < 1 \\ -\dfrac{1}{x} & \text{for} \quad x \geq 1 \end{cases}$

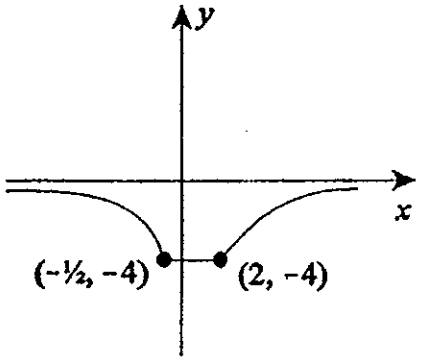
4.

Write down piecemeal descriptions for the following functions:

(a)



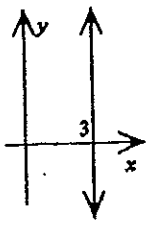
(b)



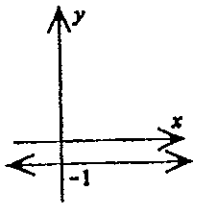
(Both curved sections are hyperbolae whose asymptotes are the x and y axes)

ANSWERS:

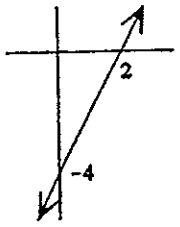
1.

(a) 

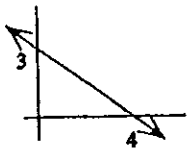
D: $x = 3$
R: all real y

(b) 

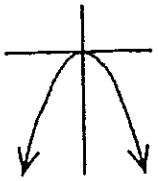
D: all real x
R: $y = -1$

(c) 

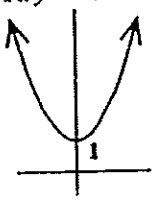
D: all real x
R: all real y

(d) 

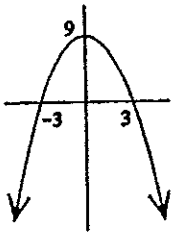
D: all real x
R: all real y

(e) 

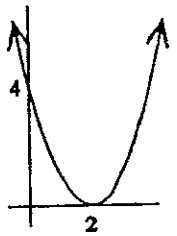
D: all real x
R: $y \le 0$

(f) 

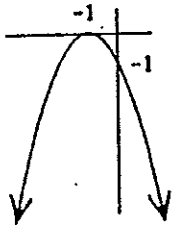
D: all real x
R: $y \ge 1$

(g) 

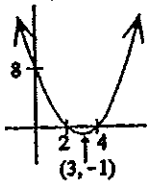
D: all real x
R: $y \le 9$

(h) 

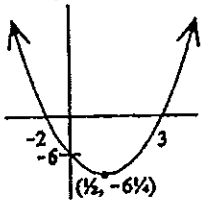
D: all real x
R: $y \ge 0$

(i) 

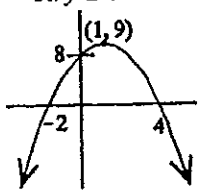
D: all real x
R: $y \le 0$

(j) 

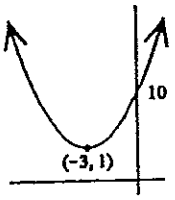
D: all real x
R: $y \ge -1$

(k) 

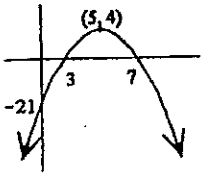
D: all real x
R: $y \ge -6¼$

(l) 

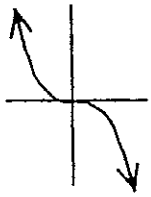
D: all real x
R: $y \le 9$

(m) 

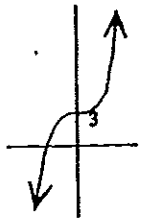
D: all real x
R: $y \ge 1$

(n) 

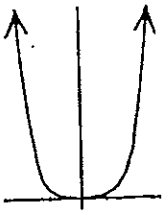
D: all real x
R: $y \le 4$

(o) 

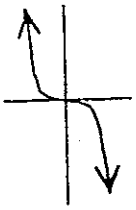
D: all real x
R: all real x

(p) 

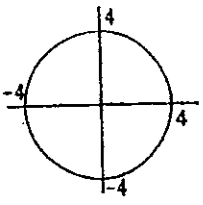
D: all real x
R: all real y

(q) 

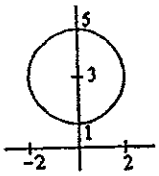
D: all real x
R: $y \ge 0$

(r) 

D: all real x
R: all real y

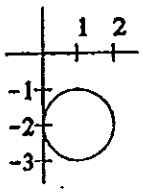
(s) 

D: $-4 \le x \le 4$
R: $-4 \le y \le 4$

(t) 

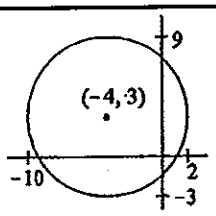
D: $-2 \le x \le 2$
R: $1 \le y \le 5$

(u)



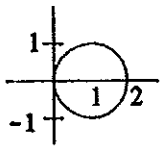
D: $0 \le x \le 2$
R: $-3 \le y \le -1$

(v)



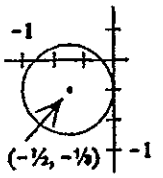
D: $-10 \le x \le 2$
R: $-3 \le y \le 9$

(w)



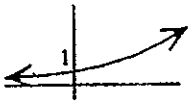
D: $0 \le x \le 2$
R: $-1 \le y \le 1$

(x)



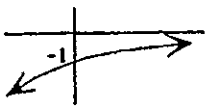
D: $-1 \le x \le 0$
R: $-\frac{5}{6} \le y \le \frac{1}{6}$

(y)



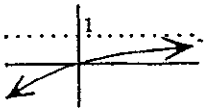
D: all real x
R: $y > 0$

(z)



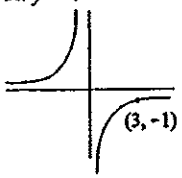
D: all real x
R: $y < 0$

(aa)



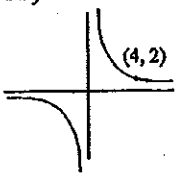
D: all real x
R: $y < 1$

(bb)



D: $x \neq 0$
R: $y \neq 0$

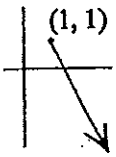
(cc)



D: $x \neq 0$
R: $y \neq 0$

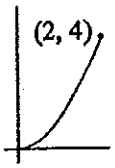
2.

(a)



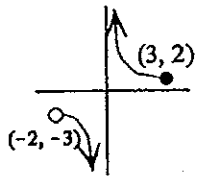
R: $y \le 1$

(b)



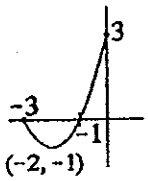
R: $0 \le y \le 4$

(c)



R: $y < -3,\ y \ge 2$

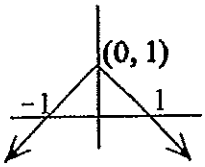
(d)



R: $-1 \le y \le 3$

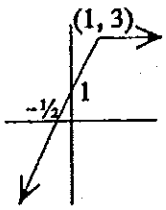
3.

(a)



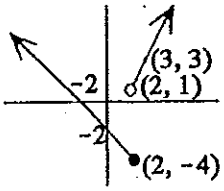
R: $y \le 1$

(b)



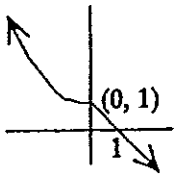
R: $y \le 3$

(c)



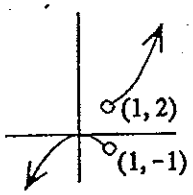
R: $y \ge -4$

(d)



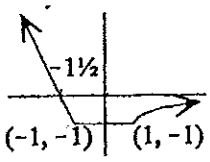
R: all real y

(e)



R: $y \le 0,\ y > 2$

(f)



R: $y \ge -1$

4.

(a) $f(x) = \begin{cases} -x - 2 & \text{if} \quad x < 2 \\ 2x - 8 & \text{if} \quad x \geq 2 \end{cases}$

(b) $f(x) = \begin{cases} \frac{2}{x} & \text{if} \quad x < -\frac{1}{2} \\ -4 & \text{if} \quad -\frac{1}{2} \leq x < 2 \\ -\frac{8}{x} & \text{if} \quad x \geq 2 \end{cases}$