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) $y = -\dfrac{3}{x}$

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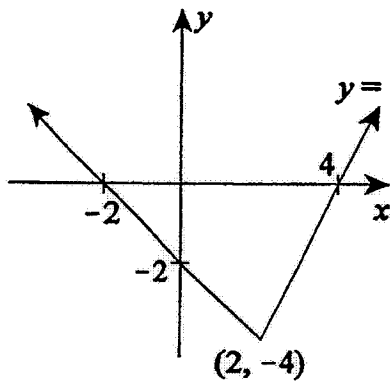
(e) $f(x) = \begin{cases} -x^2 & \text{if} \quad x < 1 \\ 2^x & \text{if} \quad x > 1 \end{cases}$

(f) $f(x) = \begin{cases} -2x - 3 & \text{for} \quad x < -1 \\ -1 & \text{for} \quad -1 \leq x < 1 \\ -\dfrac{1}{x} & \text{for} \quad x \geq 1 \end{cases}$
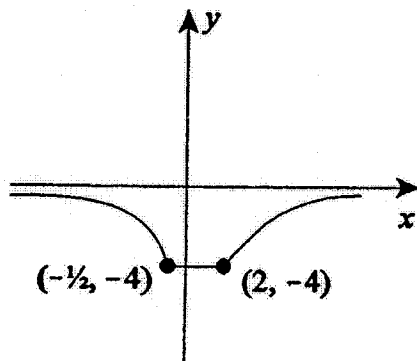
4.

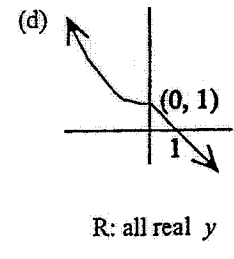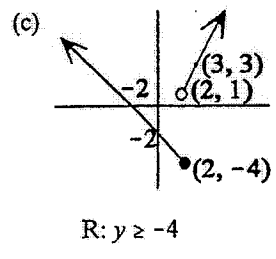Write down piecemeal descriptions for the following functions:

(a)

(b)

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

(u)

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

(v)

$(-4, 3)$
9
-10 2
-3

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

(w)

1
-1 2

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

(x)

-1

$(-\frac{1}{2}, -\frac{1}{6})$ -1

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

(y)

1

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

(z)

-1

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

(aa)

1

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

(bb)

$(3, -1)$

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

(cc)

$(4, 2)$

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

2.

(a)

$(1, 1)$

R: $y \leq 1$

(b)

$(2, 4)$

R: $0 \leq y \leq 4$
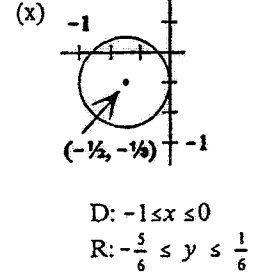
(c)

$(3, 2)$

$(-2, -3)$

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

(d)

3

-3 -1
$(-2, -1)$

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

3.

(a)

$(0, 1)$

-1 1

R: $y \leq 1$

(b)

$(1, 3)$

$-\frac{1}{2}$ 1

R: $y \leq 3$

(c)

-2 $(3, 3)$
$\circ (2, 1)$
-2
$\bullet (2, -4)$

R: $y \geq -4$

(d)

$(0, 1)$

1

R: all real y

(e)

$\circ (1, 2)$

$\circ (1, -1)$

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

(f)

$-1\frac{1}{2}$

$(-1, -1)$ $(1, -1)$

R: $y \geq -1$
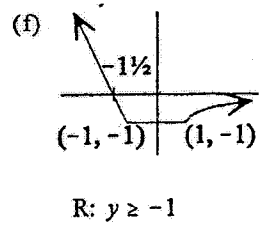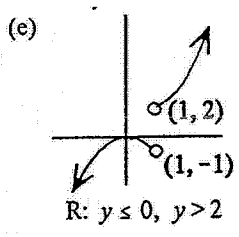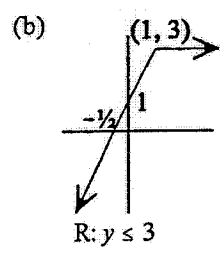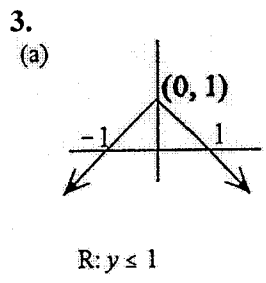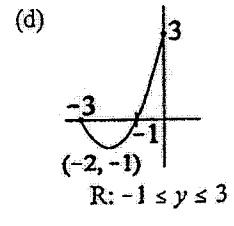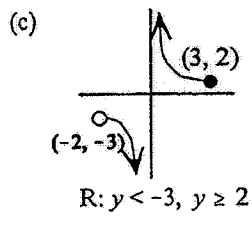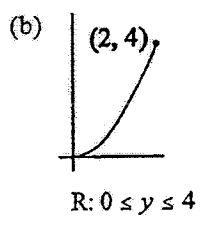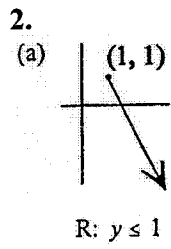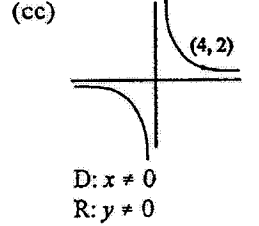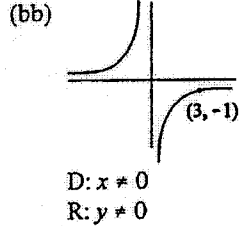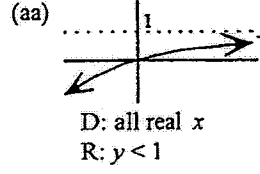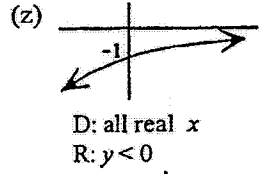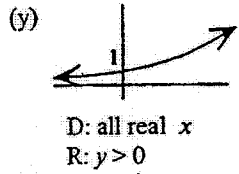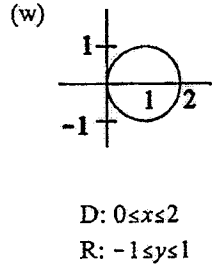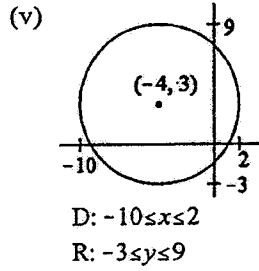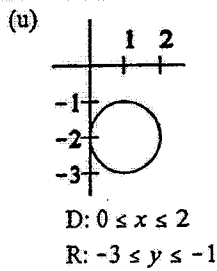
4.

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

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