Key

Chapter 4 PROBLEM SOLVING

/18

1a) Graph $y = |x^2 + 8x + 12|$ (2 marks). ***hint: graph the original function (complete the square) then take the absolute value of the graph.**

b)State the domain and range (0.5 each).

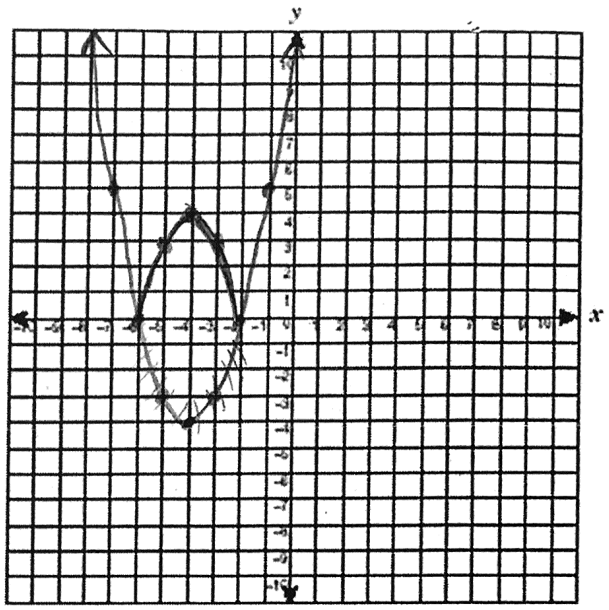
$y = (x^2 + 8x) + 12$ $b = 8$ $\frac{b}{2} = 4$ $(\frac{b}{2})^2 = 16$

$y = (x^2 + 8x + 16) - 16 + 12$

$y = (x + 4)^2 - 4$ vertex $= (-4, -4)$

$a = 1$ over 1 up 1
over 2 up 4
over 3 up 9

$(-4, -4) \rightarrow (-4, 4)$
$(-3, -3) \rightarrow (-3, 3)$
$(-5, -3) \rightarrow (-5, 3)$



DOMAIN: $x \in \mathbb{R}$

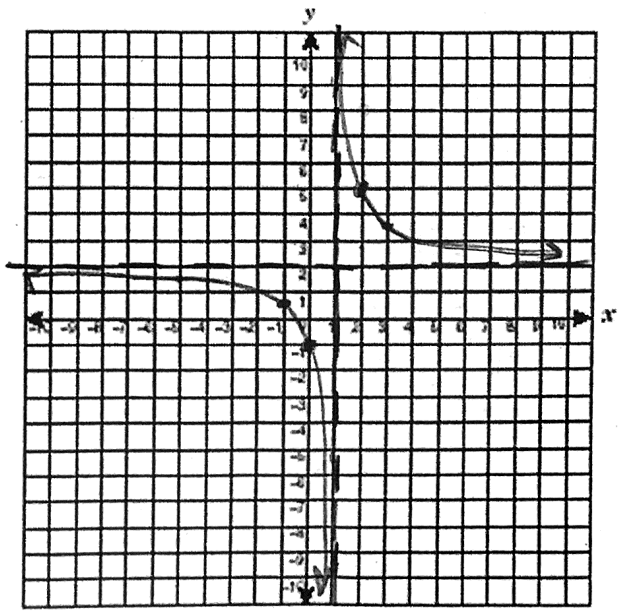
RANGE: $y \geq 0$

2a) Graph $y = \frac{2x+1}{x-1}$ (3 marks).

b) State the horizontal and vertical asymptotes (0.5 marks each).

x	y
0	-1
2	5
-1	1/2
-5	-1.5
0.5	4
10	$\frac{21}{9} = 2.3$
1.01	302

Vert Asym. $x = 1$
Horiz Asym $y = 2$



b) Horizontal Asymptotes:

$x = 1$

Vertical Asymptotes:

$y = 2$

3a) Graph $y = 2|2x - 1| - 5$ (2 marks)

b) State the domain and range (0.5 marks each).

c) Express $y = 2|2x - 1| - 5$ as a piecewise function (1 mark).

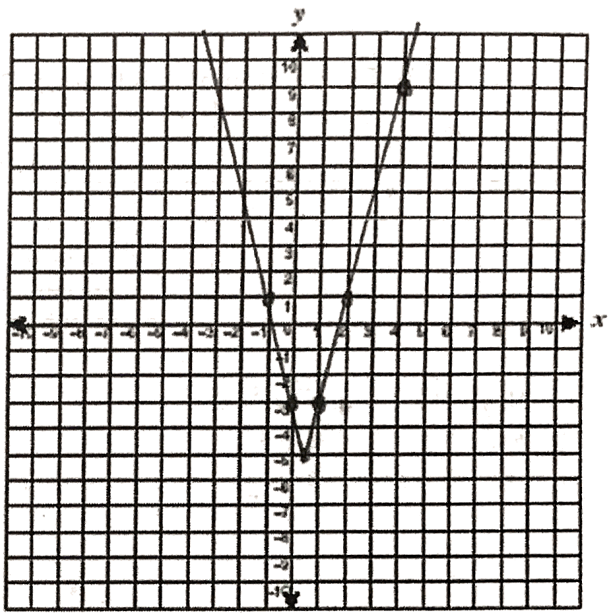
vertex $(\frac{-c}{b}, d)$

$(\frac{1}{2}, -5)$

x	y
1/2	-5
0	-3
1	-3
2	1
4	9
-1	1

$y = 2(2x - 1) - 5$
$= 4x - 2 - 5$
$= 4x - 7$

$y = 2(-(2x - 1)) - 5$
$= 2(-2x + 1) - 5$
$= -4x + 2 - 5$
$= -4x - 3$

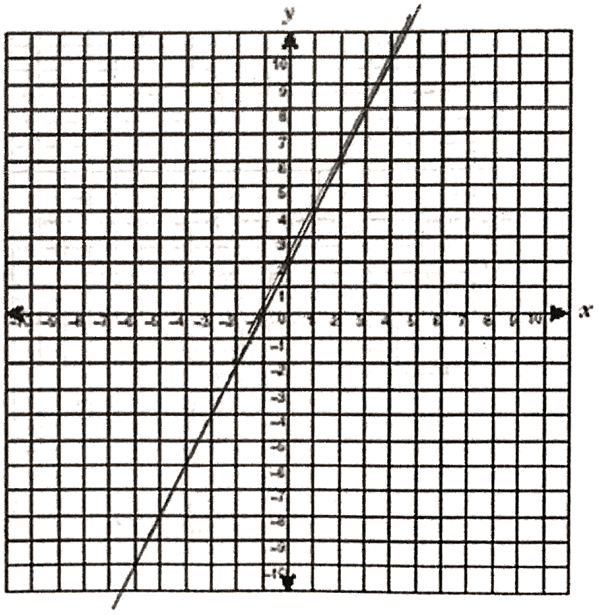


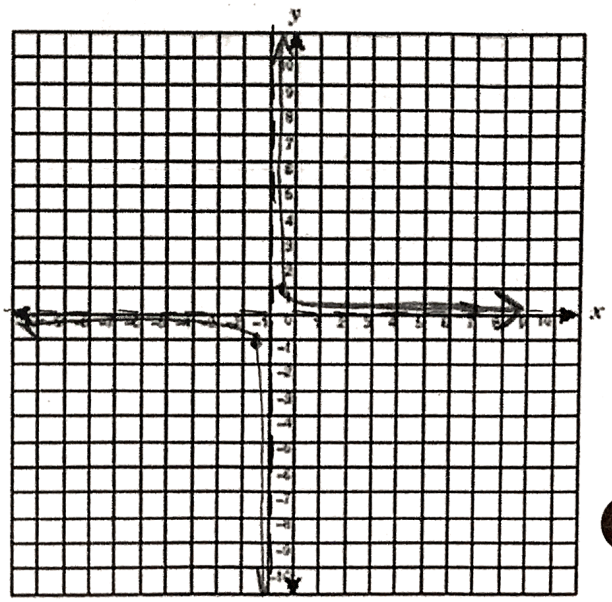
b) DOMAIN: $x \in \mathbb{R}$ RANGE: $y \geq -5$

c) Piecewise Function:

$$y = \begin{cases} 4x - 7 & x \geq \frac{1}{2} \\ -4x - 3 & x < \frac{1}{2} \end{cases}$$

4) Draw a graph of the reciprocal function using the original function graph (3 marks):





5) Solve $|2x^2 - x - 12| = 9$ (4 marks)

(+) $2x^2 - x - 12 = 9$
$-9 \quad -9$
$2x^2 - x - 21 = 0$
$2x^2 + 6x - 7x - 21 = 0$
$2x(x+3) - 7(x+3) = 0$
$(2x-7)(x+3) = 0$
$x = 7/2, -3$

(−) $2x^2 - x - 12 = -9$
$+9 \quad +9$
$2x^2 - x - 3 = 0$
$2x^2 + 2x - 3x - 3 = 0$
$2x(x+1) - 3(x+1) = 0$
$(2x-3)(x+1) = 0$
$x = 3/2, x = -1$

CHECK(S):

$x = 7/2$
$|2(\frac{7}{2})^2 - (\frac{7}{2}) - 12| = 9$
$|2(\frac{49}{4}) - \frac{7}{2} - 12| = 9$
$|\frac{49}{2} - \frac{7}{2} - 12| = 9$
$|\frac{42}{2} - 12| = 9$
$|21 - 12| = 9$
$|9| = 9$ ✓

$x = -3$
$|2(-3)^2 - (-3) - 12| = 9$
$|2(9) + 3 - 12| = 9$
$|18 + 3 - 12| = 9$
$|9| = 9$ ✓

$x = 3/2$
$|2(\frac{3}{2})^2 - (\frac{3}{2}) - 12| = 9$
$|2(\frac{9}{4}) - \frac{3}{2} - 12| = 9$
$|\frac{9}{2} - \frac{3}{2} - 12| = 9$
$|\frac{6}{2} - 12| = 9$
$|3 - 12| = 9$
$|-9| = 9$ ✓

$x = -1$
$|2(-1)^2 - (-1) - 12| = 9$
$|2(1) + 1 - 12| = 9$
$|2 + 1 - 12| = 9$
$|-9| = 9$ ✓

ANSWERS(S):

$x = -3, -1, \frac{7}{2}, \frac{3}{2}$