

tise

Sketch each of the following *to the best of your ability*. For polynomial graphs (a – c) you should be able to identify y -intercepts. For rational functions you should be able to identify all asymptotes, holes and know the shape of the graph. Verify your answers with the actual graphs on the next page.

a) $y = 4x^3 + 12x^2 - 4x - 12$

b) $f(x) = x^3 - x^2 + x - 1$

c) $y = x^4 - 3x^3 - x^2 + 3x$

d) $g(x) = \frac{6x^2 + 13x - 5}{(2x + 5)}$

e) $y = \frac{2x - 1}{2x^2 + 5x - 3}$

2. Identify the holes and vertical asymptotes for the following function: $f(x) = \frac{x^2 - 9}{x^2 + 5x + 6}$. (You do not need to sketch).

1. a) x -int, $y=0$

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

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

$$0 = 4(x^2 - 1)(x+3)$$

$$0 = 4(x+1)(x-1)(x+3)$$

$\therefore x$ -int: $\pm 1, -3$ and
 y -int is -12 .

b) $f(x) = x^3 - x^2 + x - 1$
 x -int, $f(x)=0$

$$0 = x^2(x-1) + (x-1)$$

$$0 = (x^2 + 1)(x-1)$$

$\therefore x$ -int: $(1, 0)$
and y -int $(0, -1)$

c) x -int, $y=0$

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

$$0 = x[x^2(x-3) - (x-3)]$$

$$0 = x(x^2 - 1)(x-3)$$

$$0 = x(x+1)(x-1)(x-3)$$

$\therefore x$ -int: $\pm 1, 3, 0$
and y -int $(0, 0)$

d) $g(x) = \frac{6x^2 + 13x - 5}{(2x + 5)}$
$$= \frac{(2x + 5)(3x - 1)}{(2x + 5)}$$

$$= 3x - 1$$

Hole

$$g\left(-\frac{5}{2}\right) = 3\left(-\frac{5}{2}\right) - 1$$

$$= -\frac{15}{2} - \frac{2}{2}$$

$$= -\frac{17}{2} \text{ or } -8.5$$

\therefore Hole at $\left(-\frac{5}{2}, -\frac{17}{2}\right)$

or $(-2.5, -8.5)$

e) $y = \frac{2x - 1}{2x^2 + 5x - 3}$
$$= \frac{2x - 1}{(2x - 1)(x + 3)}$$

$$= \frac{1}{x + 3}$$

\therefore VA: $x = -3$, HA: $y = 0$
and hole at $x = \frac{1}{2}$.

sub $x = \frac{1}{2}$

$$y = 1 \div \left(\frac{1}{2} + 3\right)$$

$$= 1 \div \frac{7}{2}$$

$$= 1 \times \frac{2}{7}$$

$$= \frac{2}{7}$$

\therefore Hole at $\left(\frac{1}{2}, \frac{2}{7}\right)$

#2.

$$f(x) = \frac{(x+3)(x-3)}{(x+3)(x+2)}$$

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

VA: $x = -2$

Hole

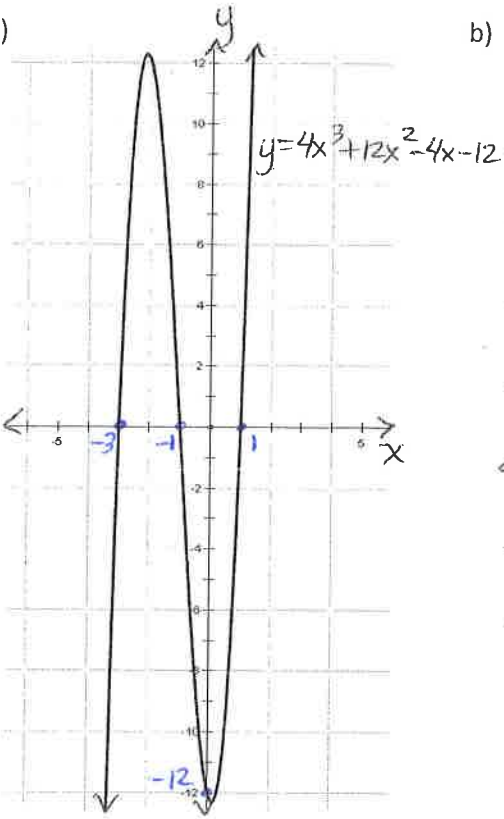
$$f(-3) = \frac{-3-3}{-3+2}$$

$$= 6$$

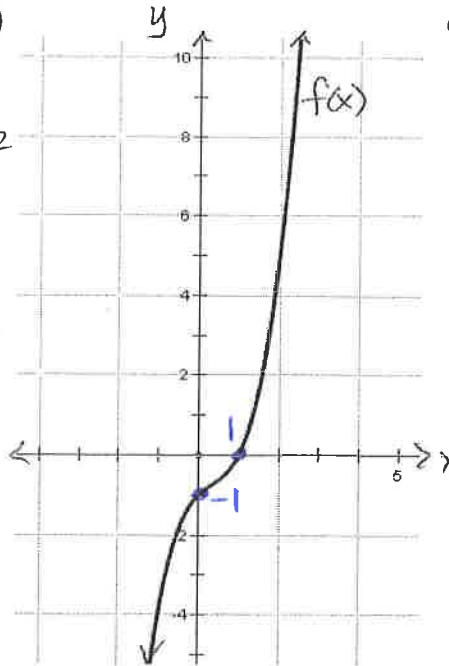
\therefore Hole at
 $(-3, 6)$

ANSWERS

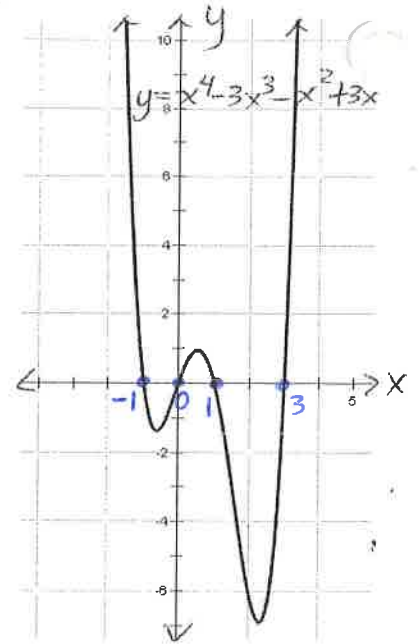
1. a)



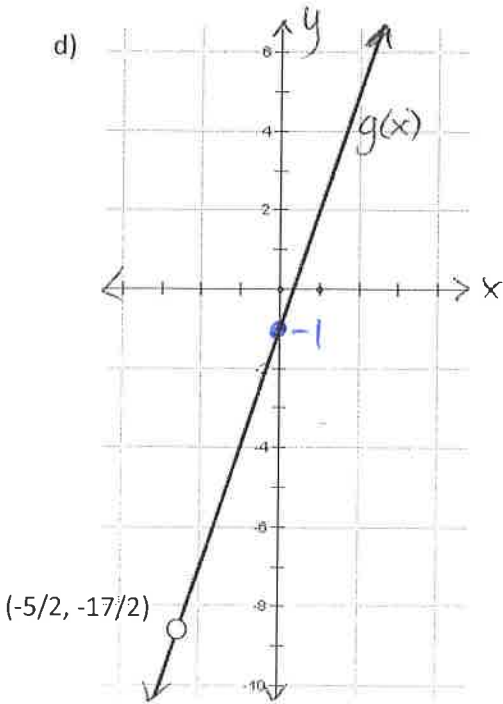
b)



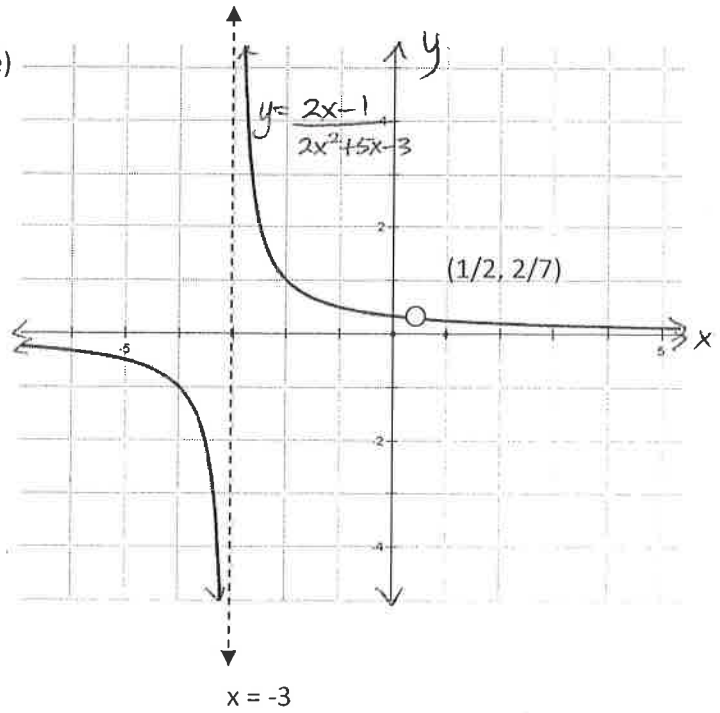
c)



d)



e)



2. $x = -2$ is a vertical asymptote. There is a hole at $(-3, 6)$.