1. Find the domain of the functions:

a) $f(x)=\dfrac{x^2-4}{x^2-3x}$

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

c) $f(x)=\dfrac{1}{x-7}$

d) $f(x)=\sqrt{x+1}$

e) $f(x)=\dfrac{2x}{x^2+5x-6}$

f) $f(x)=\sqrt{x^2-4}$

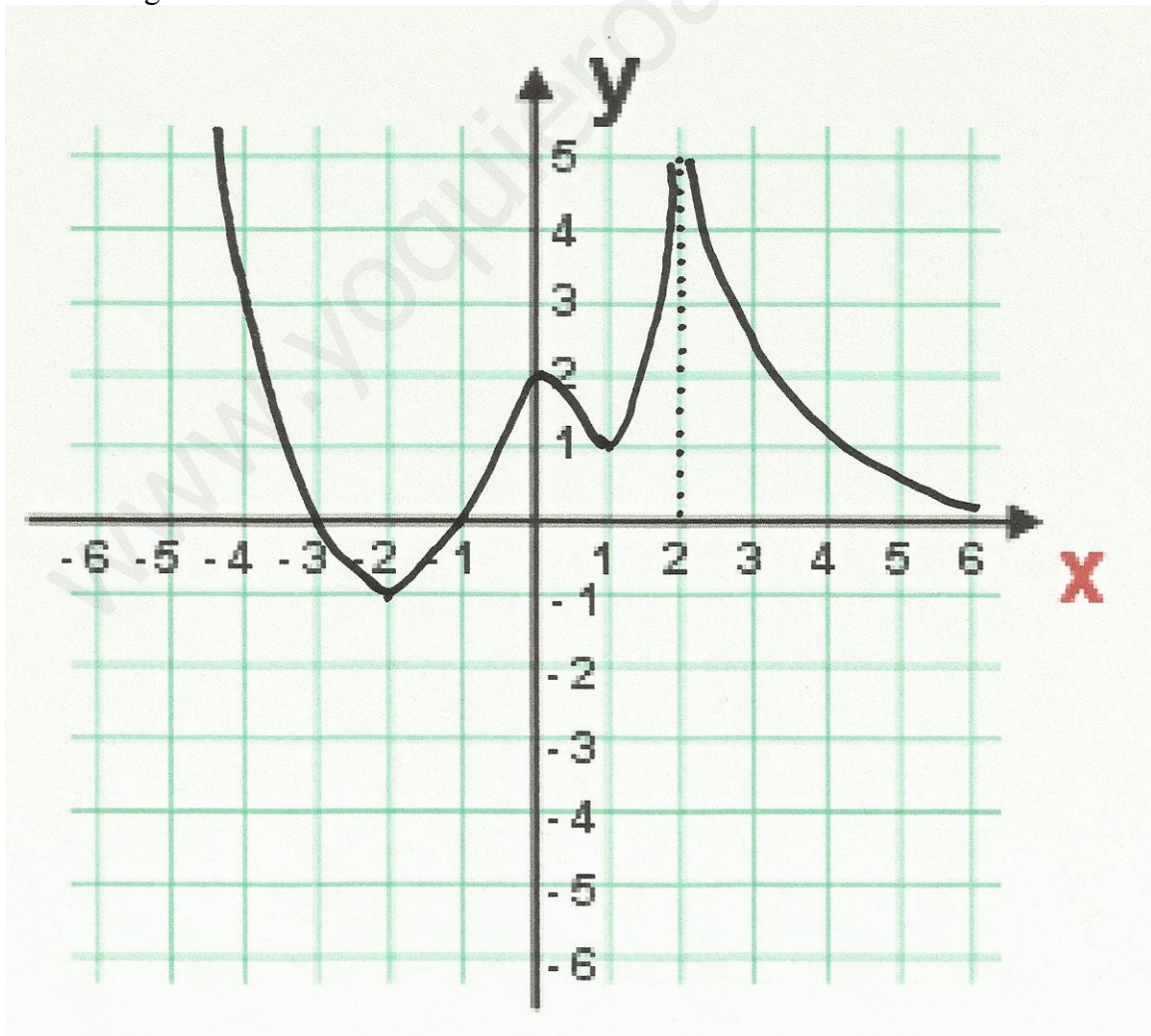2. Graph the following piecewise functions, and write their domain and range:

a) $f(x)=\begin{cases} x+3, & if \ \ x<0 \\ 1, & if \ \ 0\leqslant x\leqslant 2 \\ x-1, & if \ \ x>2 \end{cases}$

b) $f(x)=\begin{cases} 2, & if \ \ x<-1 \\ x^2, & if \ \ -1\leqslant x<2 \\ x, & if \ \ x\geqslant 2 \end{cases}$

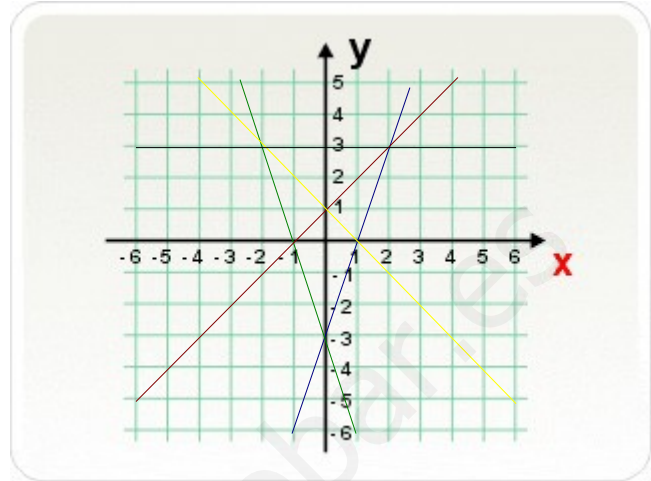c) $f(x)=\begin{cases} -x, & if \ \ x\leqslant 0 \\ 2, & if \ \ 1\leqslant x<3 \\ 1, & if \ \ x\geqslant 3 \end{cases}$

d) $f(x)=\begin{cases} x-1, & if \ \ x<1 \\ x, & if \ \ x\geqslant 2 \end{cases}$

3. Write the properties (domain, range, continuity, increasing and decreasing intervals, maxima and minima, axis intercepts, symmetry...)of the function whose graph is the following:

4. Find the equation of the straight line that passes through the points (0,-3) and (4,1).

5. Find the equation of the straight line that passes through the origin and through the point (2,3).

6. Match each linear function with its straight line:

a) $y=x+1$

b) $y=-x+1$

c) $y=3x-3$

d) $y=-3x-3$

e) $y=3$

7. Given the parabola $y=x^2-6x+5$:
   a) Calculate the axes intercepts.
   b) Calculate the coordinates of its vertex.
   c) Write the equation of its axis of symmetry.
   d) Graph the function.

8. The parabola $y=ax^2+bx+c$ passes through the point (0,3). What is the values of c? Apart from that, the parabola passes trough the points (1,0) and (4,3). Find the value of a and b.

9. Graphs the hyperbolas whose equations are:

a) $y=\dfrac{1}{x-2}$

b) $y=\dfrac{1}{x+2}-1$

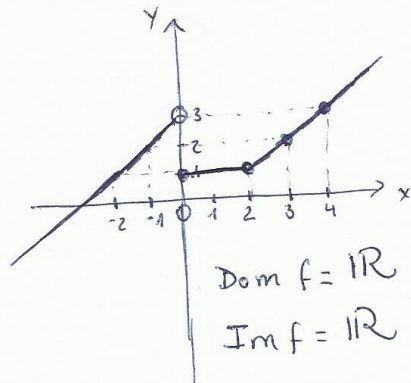Write the equations of their asymptotes (distinguish between vertical and horizontal).

SOLUTIONS:

1. a) Dom $f = \mathbb{R} - \{0, 3\}$ b) Dom $f = \mathbb{R}$ c) Dom $f = \mathbb{R} - \{7\}$

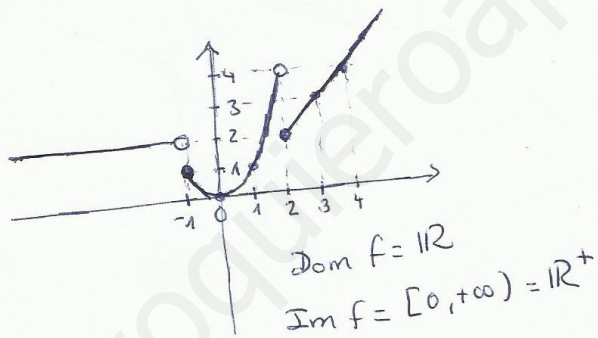   d) Dom $f = [1, +\infty)$ e) Dom $f = \mathbb{R} - \{1, -6\}$

   f) Dom $f = (-\infty, -2] \cup [2, +\infty)$

2. a)

Dom $f = \mathbb{R}$

Im $f = \mathbb{R}$

   b)

Dom $f = \mathbb{R}$

Im $f = [0, +\infty) = \mathbb{R}^+$

   c)

Dom $f = (-\infty, 0] \cup [1, \infty)$

Im $f = [0, +\infty) = \mathbb{R}^+$
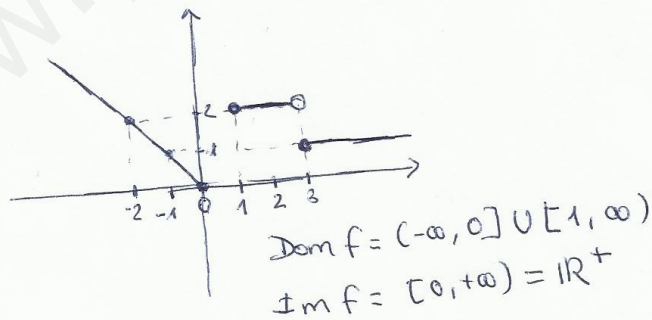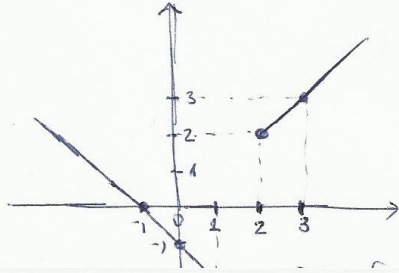
d)

4. $y = x - 3$

5. $y = \dfrac{2}{3} x$

6. a) $y = x + 1 \rightarrow$ red

    b) $y = -x + 1 \rightarrow$ yellow

    c) $y = 3x - 3 \rightarrow$ blue

    d) $y = -3x - 3 \rightarrow$ green

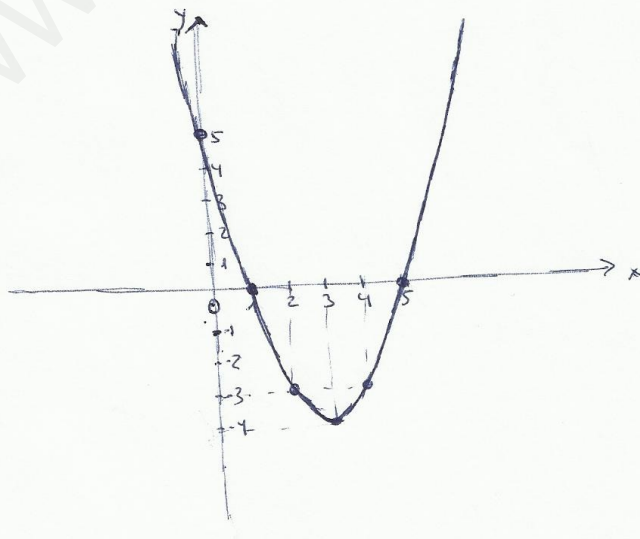   e) $y = 3 \rightarrow$ black

7. a) x-intercepts: $(5, 0)$ and $(1, 0)$

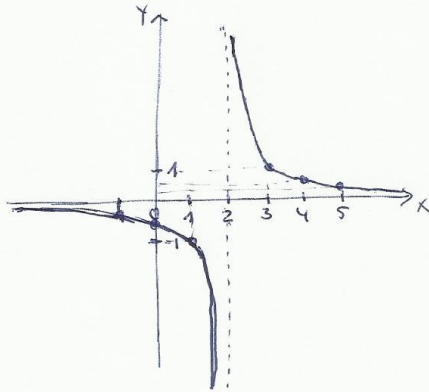   y-intercept: $(0, 5)$

    b) Vertex $(3, -4)$

    c) Axis of symmetry: $x = 3$
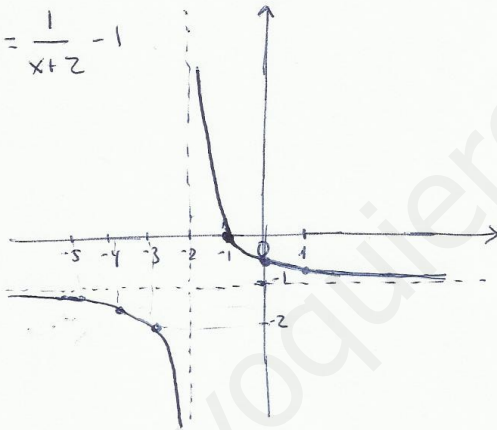
    d)

8. $a = 1$ $b = -4$ $c = 3$

9. a) $y = \dfrac{1}{x-2}$

Vertical asymptotes: $x = 2$

Horizonta asymptotes: $y = 0$

b) $y = \dfrac{1}{x+2} - 1$

Vertical asymptotes: $x = -2$

Horitontal asymptotes: $y = -1$