Exercise 1: (1 point) Find the value of k so that when dividing $P(x)=kx^3-5x^2+3x-7$ by $(x-2)$ the remainder is 19 $\rightarrow$ $k=5$

Exercise 2: (2.25 points) Factorize the following polynomials and indicate their roots:

a) $Q(x)=x^4+7x^3+16x^2+12x$ $\rightarrow$ $\begin{cases} \text{Roots: } x=0, \ x=-2 \text{ double}, x=-3 \\ \text{Factorization: } x(x+2)^2(x+3) \end{cases}$ (1)

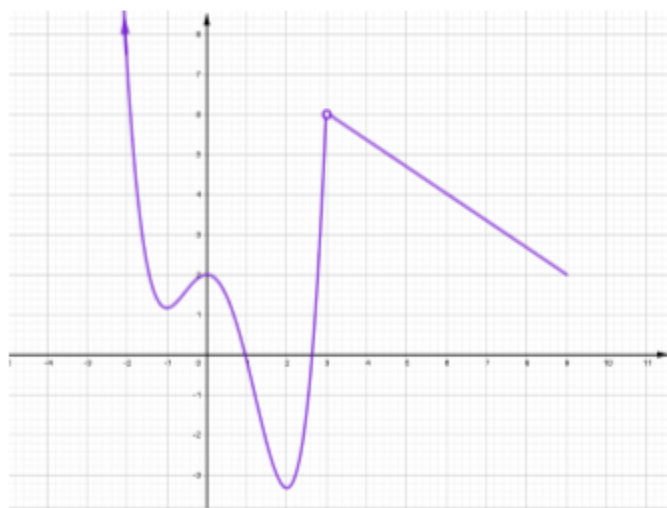b) $P(x)=x^5-x^4-17x^3+17x^2+16x-16$ $\begin{cases} \text{Roots: } x=-1, \ x=1 \text{ double}, x=\pm 4 \\ \text{Fact.: } (x+1)(x-1)^2(x+4)(x-4) \end{cases}$ (1.25)

Exercise 3: (1.5 points) Find the domain of the following functions:

a) $f(x)=\dfrac{2x+5}{x^3-6x^2-7x}$ $\rightarrow$ $\text{Dom} f = \mathbb{R}-\{-1,0,7\}$ (1)

b) $f(x)=\dfrac{x^2-4}{\sqrt{x-9}}$ $\rightarrow$ $\text{Dom} f =(9,+\infty)$ (0.5)

Exercise 4: (1.5 points) Given the graph of a certain function:

a) Find its domain and its image $\text{Dom} f =(-\infty,3)\cup(3,9]$ $\text{Im} f =[-3.2,+\infty)$

b) Study its monotony

   Increases: $(-1,0)$ and $(2,3)$ Decreases: $(-\infty,-1)$ and $(0,2)$ and $(3,9)$
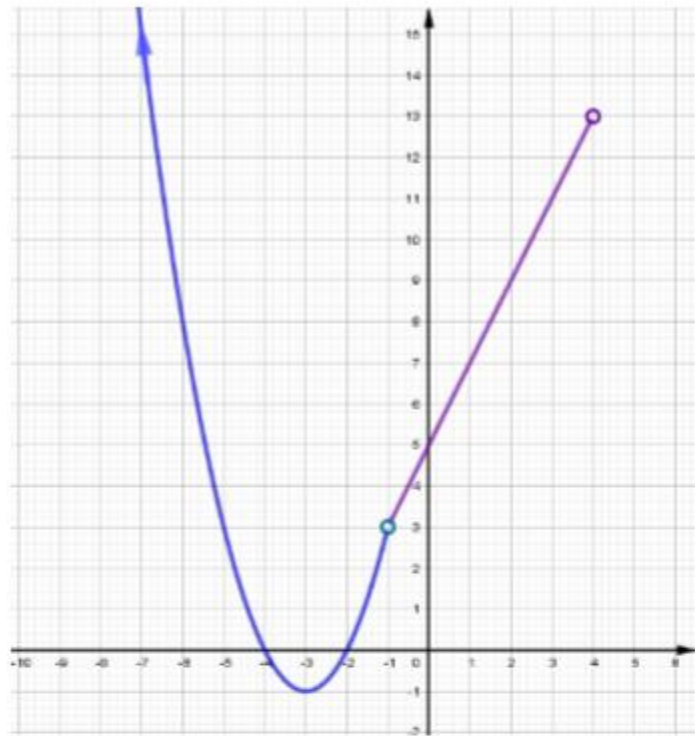
c) Study the extrema

   Relative maxima: $x=0$ Absolute maximum: $\not\exists$

   Relative minima: $x=-1, \ x=2, \ x=9$ Absolute minimum: $x=2$

Exercise 5: (2 points) Plot graph of the function $f(x) = \begin{cases} x^2 + 6x + 8 & x < -1 \\ 2x + 5 & -1 < x < 4 \end{cases}$

Exercise 6: (1.75 points)

a) Find the general equation of the line that goes through the points $P(7,-2)$ and $Q(4,5)$

$7x + 3y - 43 = 0$ (1.25)

b) Find a parallel line to $2x - 7y - 9 = 0$ going through the point $P(-2,4)$

$2x - 7y + 32 = 0$ (0.5)