BECA / IB Math 4-Polynomial and rational functions Name:
11 February 2022

4.11 Exam: Polynomial and rational functions

1. Shown in the plot below is the function $f(x) = x^3 - x^2 - 9x + 9$.

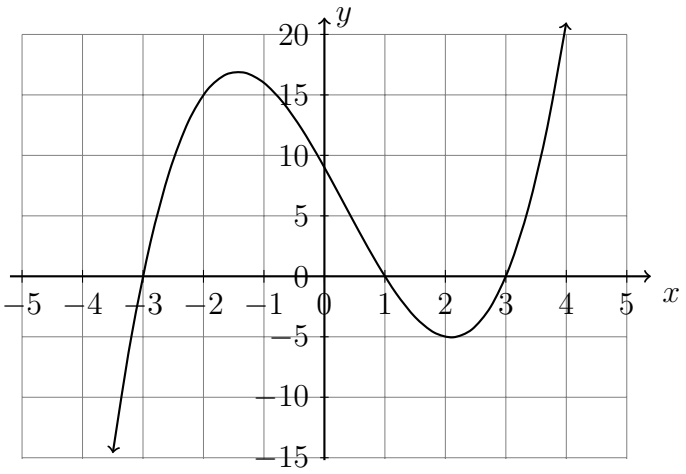
   (a) Write down the value of $f(0)$. On the graph, mark the point for $f(0)$ with a star.

   (b) Write down the solutions to $f(x) = 0$. Mark them with "X" marks on the graph.

   (c) Mark the portion of the function that is *decreasing* with a squiggly line.

   (d) Label the local maximum and local minimum as ordered pairs.

   (e) Show that 1 is an x-intercept because $x = 1$ is a solution to $f(x) = 0$.



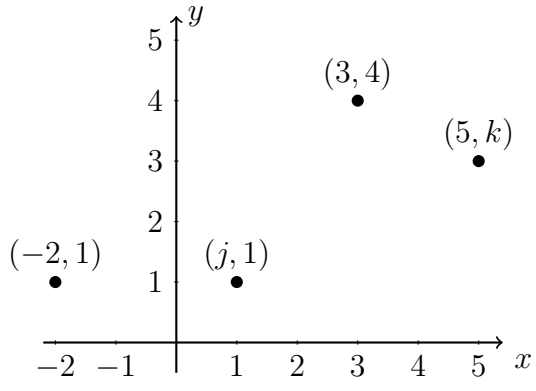
2. A function composed of four points $\{(-2, 1), (j, 1), (3, 4), (5, k)\}$ is plotted on the below.

   (a) Write down j

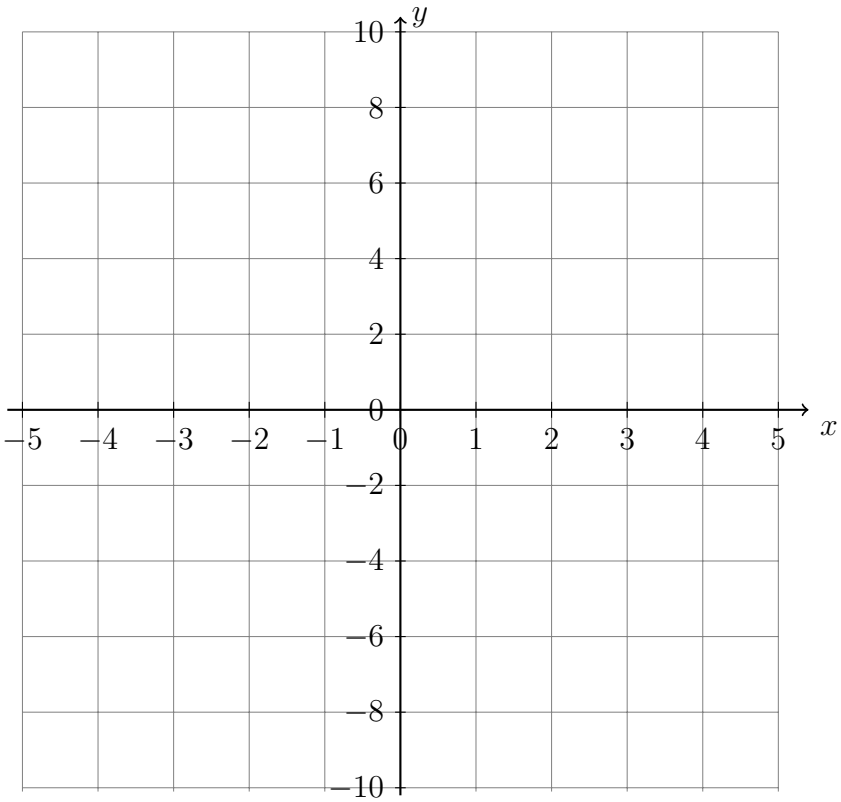
   (b) Write down k

   (c) Write down the domain.

   (d) Add an ordered pair to the relation so that it would *not* be a function.



3. Plot the function $h(x) = x^3 + x^2 - 6x$, labeling the $x-$ and y-intercepts. Mark the local maximum and minimums as ordered pairs.



4. The function $f(x) = ax^2 + bx + c$ is graphed below over its domain, $p \leq x < q$.

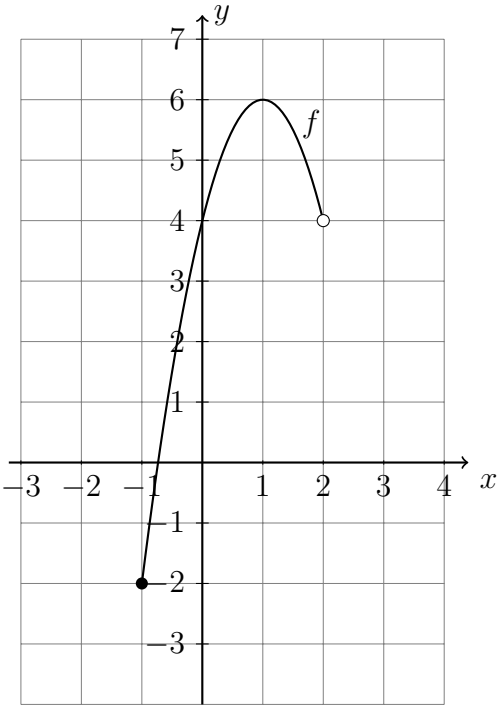
   (a) Write down the value of c.

   (b) Write down $f(-1)$.

   (c) Find x such that $f(x) = 6$.

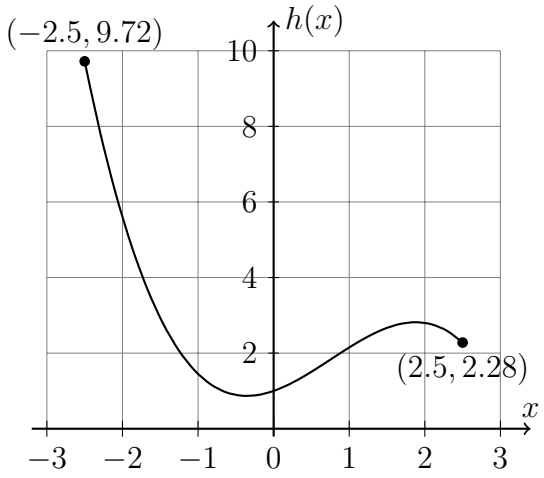
   (d) Write down the values of p, q.

   (e) Write down the range of f.



BECA / IB Math 4-Polynomial and rational functions Name:
11 February 2022

5. A ski jump is modeled by the cubic function $h(x) = 1.0 + 0.7x + 0.8x^2 - 0.35x^3$ where h is the height in meters above ground and x is the horizontal distance (m).



(a) The two ends of the ramp are marked as ordered pairs. How wide is the ramp in meters?

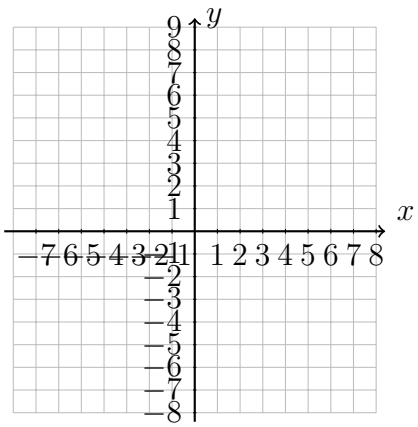
(b) What is the total vertical descent from the top of the ramp to its lowest point?

6. Given two functions, a quadratic function $f(x) = 0.6x^2 + 2.1x - 3$ and a linear function $g(x) = 1.2x + 2$.

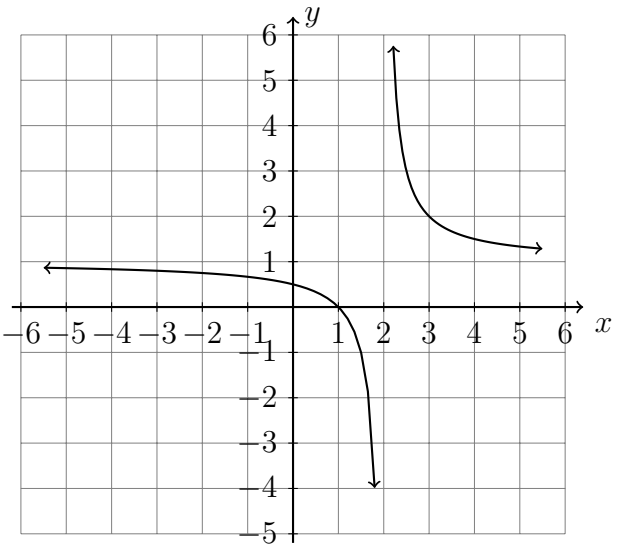
(a) Graph the parabola $y = f(x)$, marking the y-intercept and the vertex as an ordered pair.

(b) Find the coordinates of the two intercepts with the x-axis, the roots or zeros of $f(x)$.

(c) Plot the linear function, $y = g(x)$. Mark and label the two intersections of the two functions $f(x) = g(x)$ as ordered pairs. Round to the nearest hundredth.



7. A rational function of the form $f(x) = \dfrac{1}{x-p} + q$ is shown on the grid below.



   (a) Write down the equation of the horizontal asymptote.

   (b) Write down the equation of the vertical asymptote.

   (c) Hence, write down p and q.

   (d) Find $f(0)$.

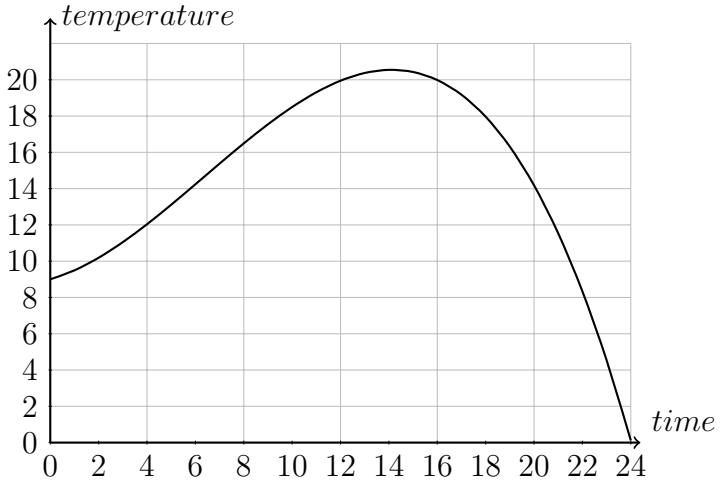
   (e) Solve for x such that $f(x) = 0$.

8. The temperature (C°) over a 24 hour day starting at midnight is modeled by the function $f(t) = -0.0063t^3 + 0.12t^2 + 0.38t + 9$.

   (a) Write down the temperature at midnight, when $t = 0$.

   (b) Over what interval is the temperature increasing?

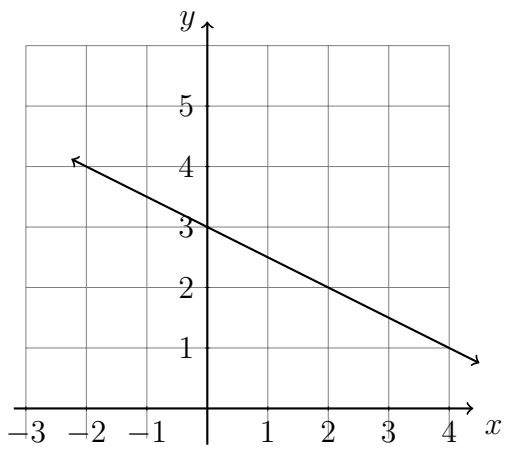
   (c) Find the maximum temperature during the day.



BECA / IB Math 4-Polynomial and rational functions Name:
11 February 2022

Linear functions

9. A linear function f is graphed below.



   (a) Write down it's slope.
   $m =$

   (b) Write down it's y-intercept.
   $b =$

   (c) Write down the equation of the line.

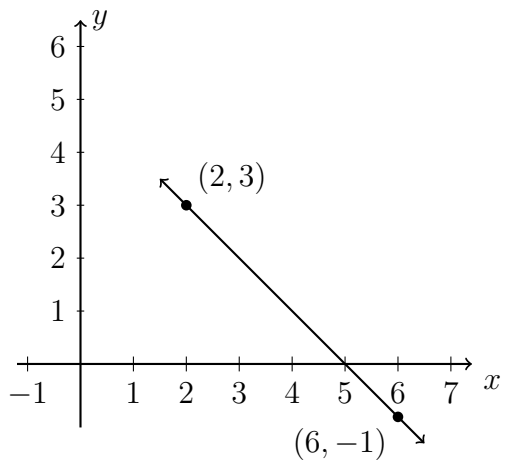
10. Write the linear equation $y + 1 = 2(x - 6)$ in the form $y = mx + c$.

11. A line has a gradient (slope) of $-\frac{3}{2}$ and passes through the point $(6, 1)$. Find the equation of the line in the form $y = mx + c$.

12. A line goes through the points $(2, 3)$ and $(6, -1)$. [5]

    (a) Find the gradient of the line.

    (b) Find the equation of the line in the form $y = mx + c$.



13. A linear equation is desired to model a set of data.

    (a) Plot the following points on the grid: $(-4, 2)$, $(-3, 1)$, $(-1, 2)$, $(1, 4)$, $(3, 5)$, $(5, 5)$

    (b) Draw a line of best fit through the data. (use a straight edge for full credit)

    (c) Write down the equation of the line.