

### 4.9 PreQuiz: Polynomial and rational functions

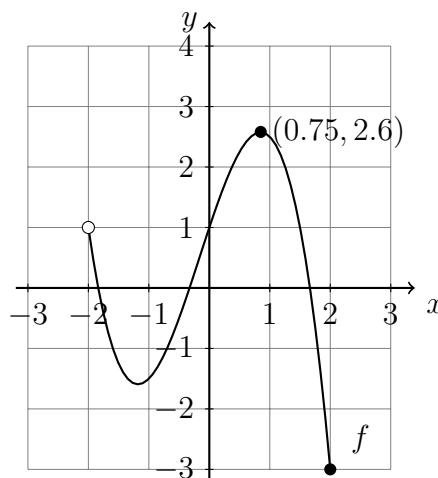
1. The graph of a function  $f$  is shown on the grid below.

(a) Write down  $f(0)$

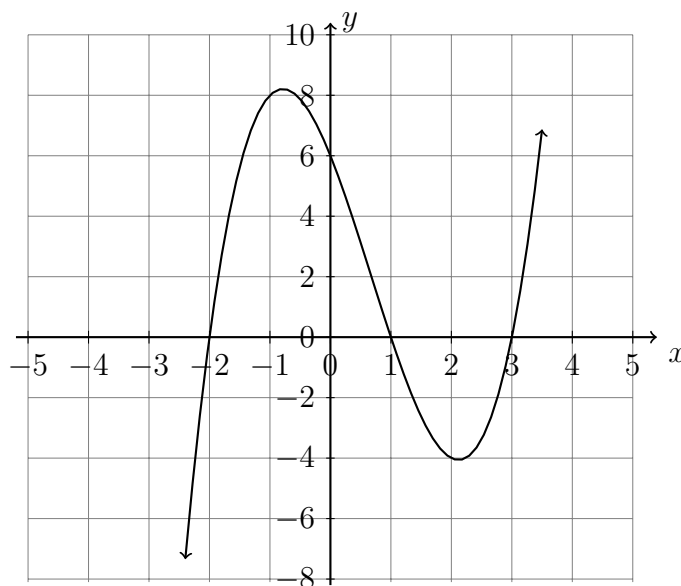
(b) Find  $x$  for  $f(x) = -3$ .

(c) Write down the domain.

(d) Write down the range.



2. Part of the function  $f(x) = x^3 - 2x^2 - 5x + 6$  is shown on the graph.



(a) Write down the  $y$ -intercept.

(b) Write down the  $x$ -intercepts.

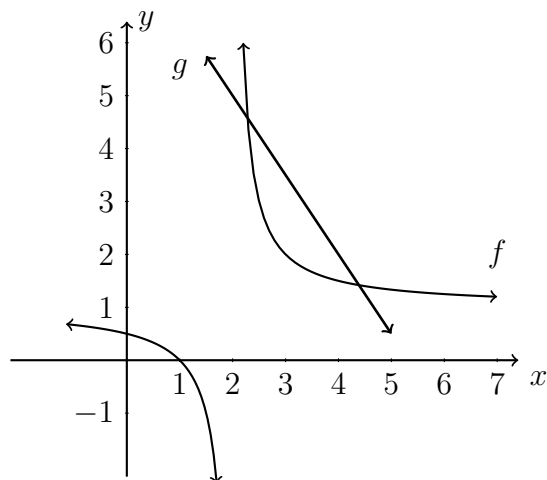
(c) Label the local maximum and local minimum as ordered pairs.

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

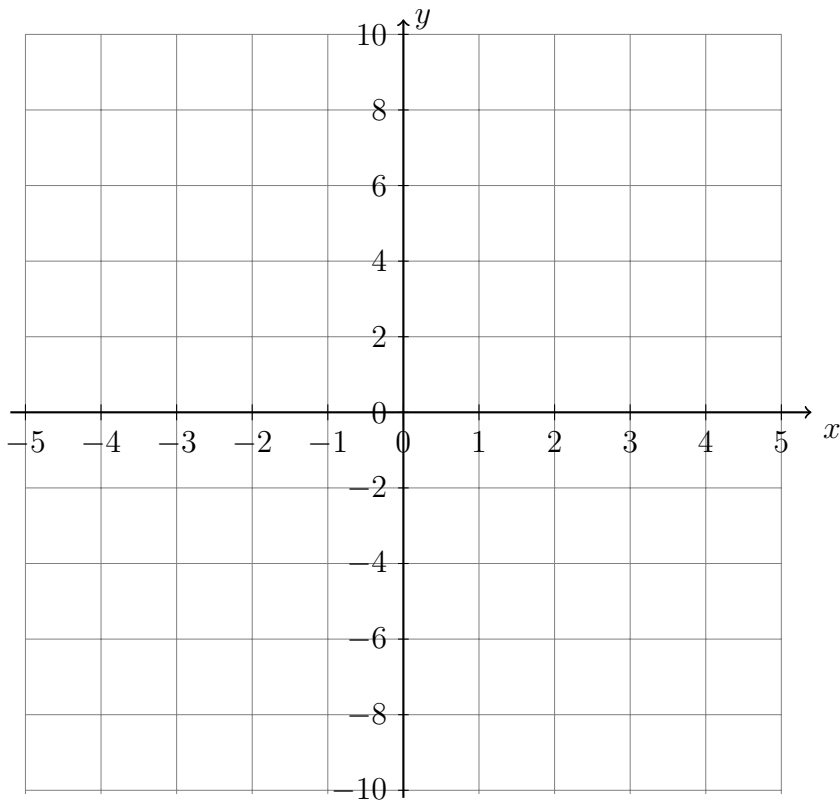
3. The rational function  $f(x) = \frac{1}{x-2} + 1$  and the linear function  $g(x) = -\frac{3}{2}x + 8$  are graphed below.

(a) Find the solutions to  $f(x) = g(x)$ .

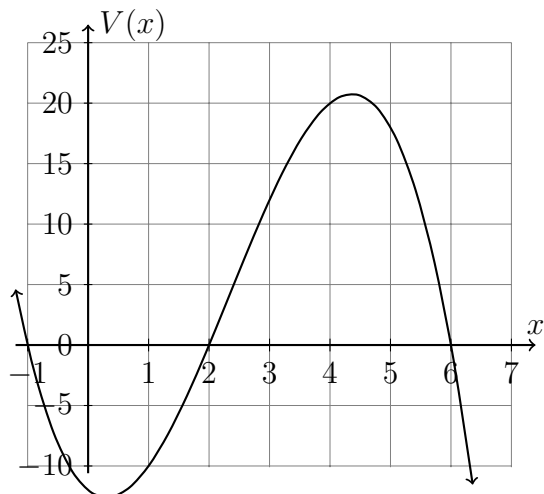
(b) Write down the equation of the vertical asymptote to  $f$ .



4. 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.



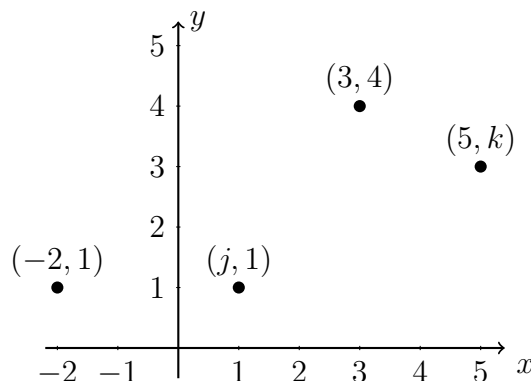
5. A cardboard box manufacturer is building boxes with length represented by  $x + 1$ , width by  $6 - x$ , and height by  $x - 2$ . The volume of the box is modeled below.



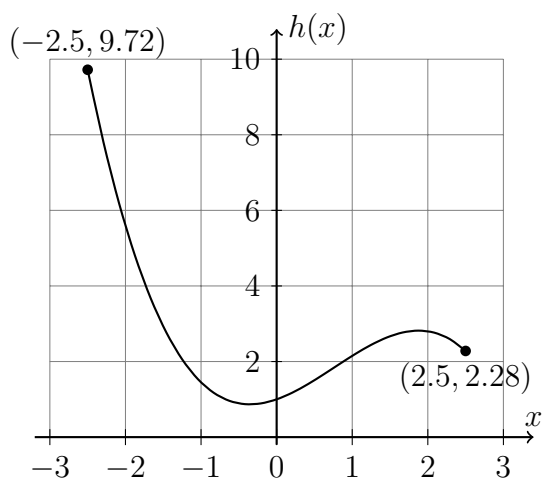
- Over what interval of positive  $x$  values is the volume positive?
- Estimate the maximum possible volume of the box.
- Find the value of  $x$  would maximize the volume of the box.

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

- Write down  $j$
- Write down  $k$
- Write down the domain.
- Add an ordered pair to the relation so that it would *not* be a function.



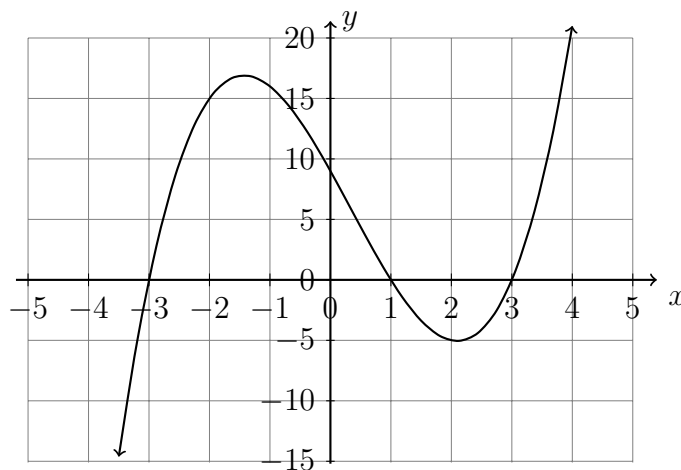
7. A ski jump is modeled by the cubic function  $h(x) = 1.0 + 0.7x + 0.8x^2 - 0.35x^3$  where  $h$  is the height in meters above ground and  $x$  is the horizontal distance (m).



- The two ends of the ramp are marked as ordered pairs. How wide is the ramp in meters?
- What is the total vertical descent from the top of the ramp to its lowest point?

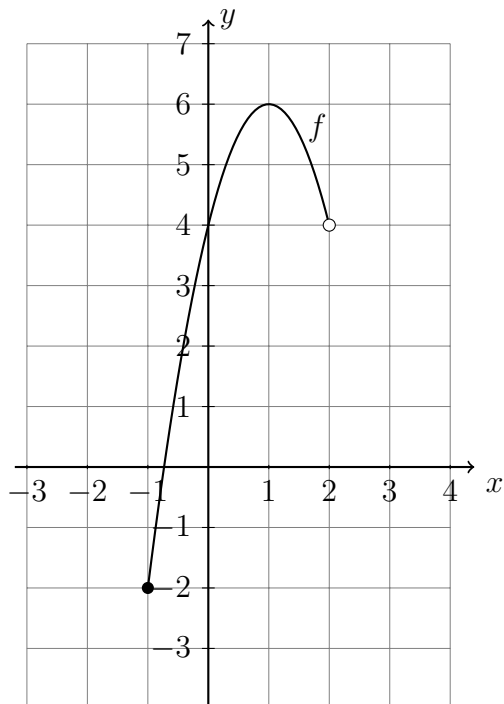
8. Shown in the plot below is the function  $f(x) = x^3 - x^2 - 9x + 9$ .

- (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.



9. 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  $f$ .



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

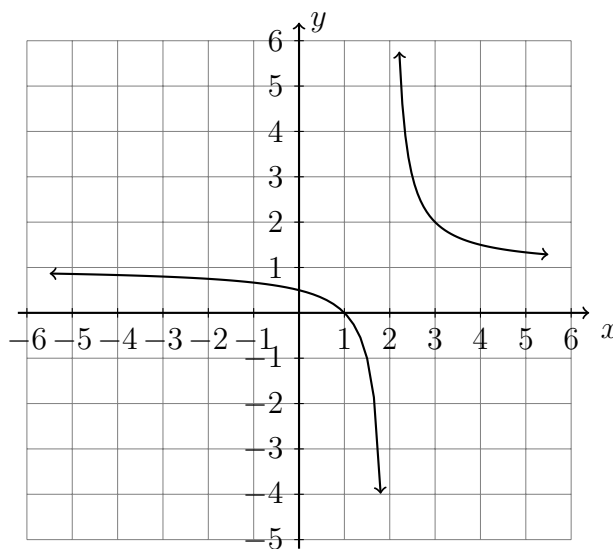
(a) Write down the equation of the horizontal asymptote.

(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  $f(x) = 0$ .



11. The temperature ( $C^\circ$ ) 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.

