

## 4.11 Exam: Polynomial and rational functions

CCSS.HSF.IF.C.7

1. Shown in the plot below is the function  $f(x) = -x^3 + 13x - 12$ .

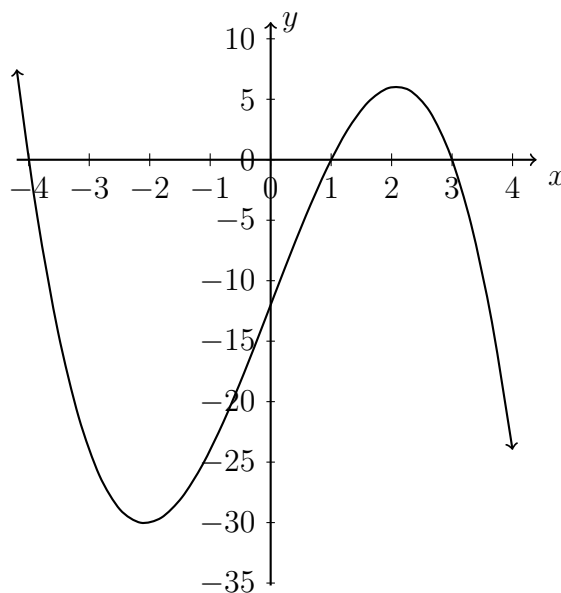
(a) Write down the value of  $f(0)$ .

(b) Write down the solutions to  $f(x) = 0$ .

(c) Mark the portion of the function that is *increasing* 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  $f(x) = 0$ .



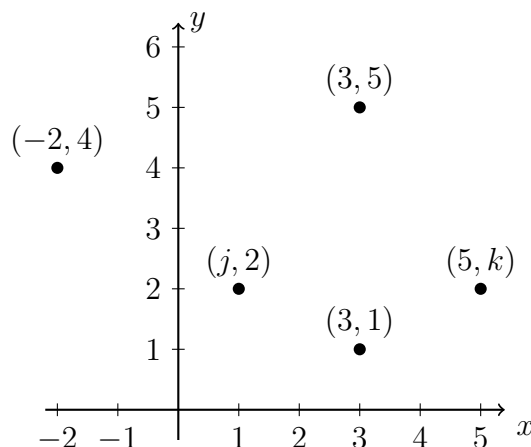
2. A relation composed of five points  $\{(-2, 4), (j, 2), (3, 1), (3, 5), (5, k)\}$  is plotted on the below.

(a) Write down  $j$

(b) Write down  $k$

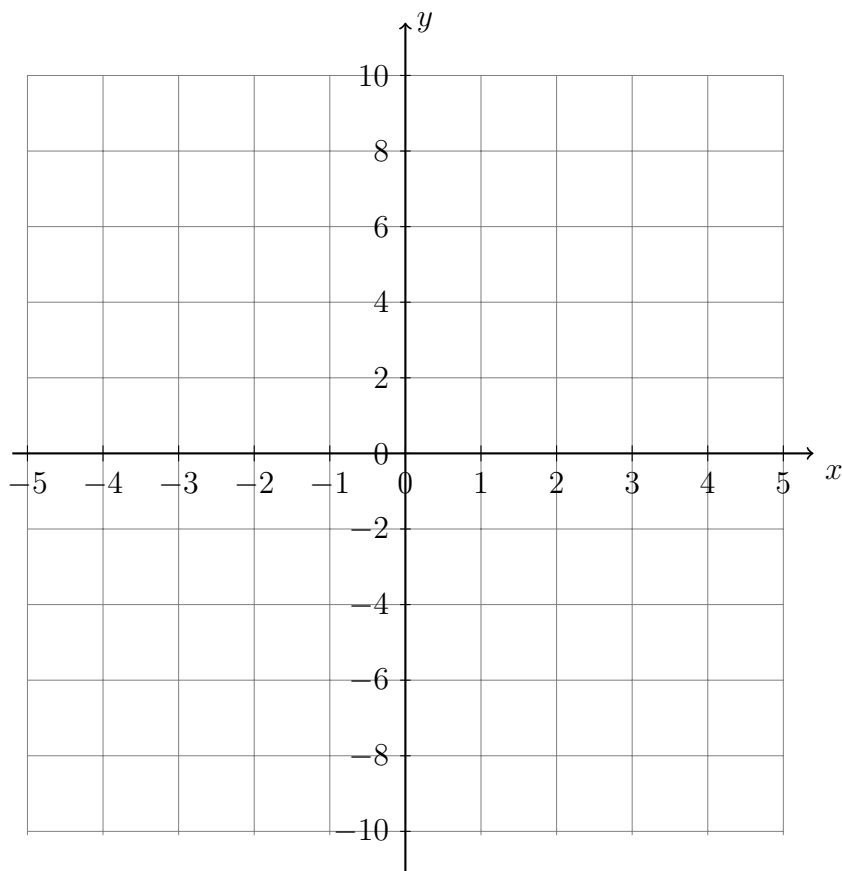
(c) Write down the range.

(d) Name a point that, if removed, would make the relation a function.



3. Accurately plot the function  $h(x) = -x^3 + 3x^2 + 6x - 8$ .

Mark the local maximum and minimums as ordered pairs.



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

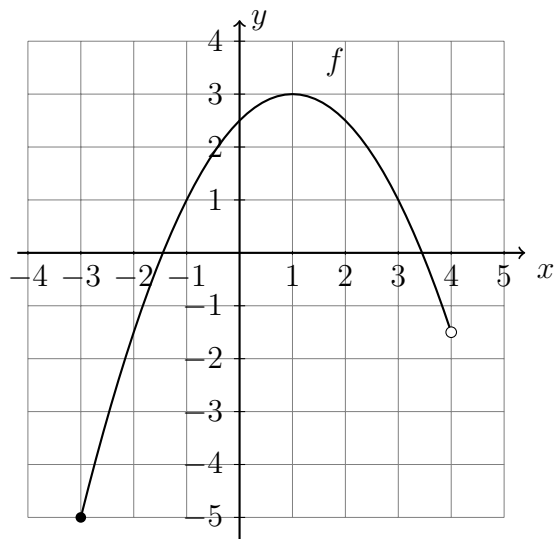
(a) Write down the maximum value of  $f$ .

(b) Write down  $f(-3)$ .

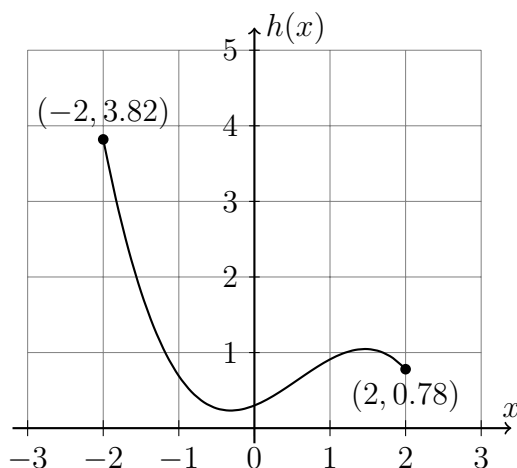
(c) Find two values for  $x$  such that  $f(x) = 1$ .

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

(e) Write down the range of  $f$ .



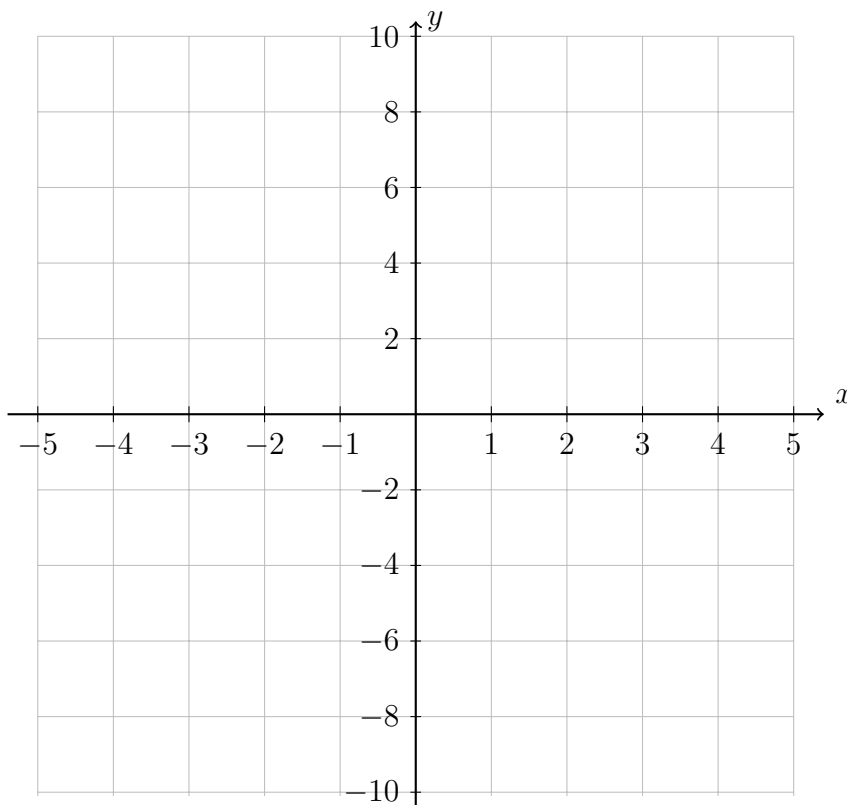
5. A pool slide is modeled by the cubic function  $h(x) = 0.3 + 0.4x + 0.5x^2 - 0.29x^3$  where  $h$  is the height in meters above ground and  $x$  is the horizontal distance (in meters).



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

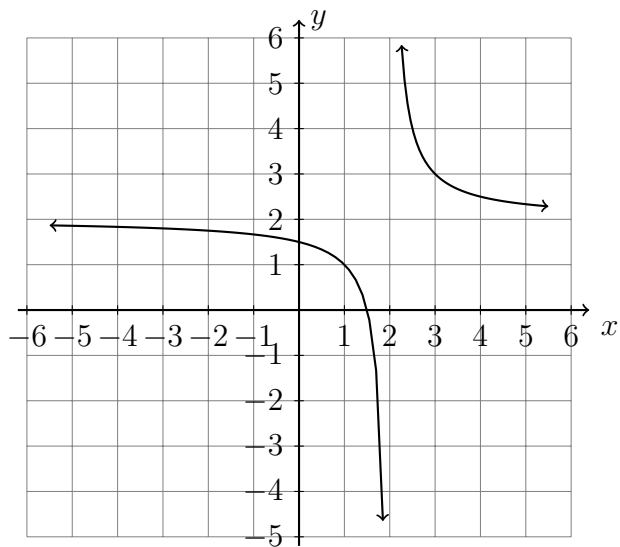
6. Accurately plot the two functions,  $f(x) = 1.75x^2 + 5.1x - 2$  and  $g(x) = 2.5x + 3.4$ .

Mark and label the two intersections,  $f(x) = g(x)$ , as ordered pairs. Round to the nearest hundredth.



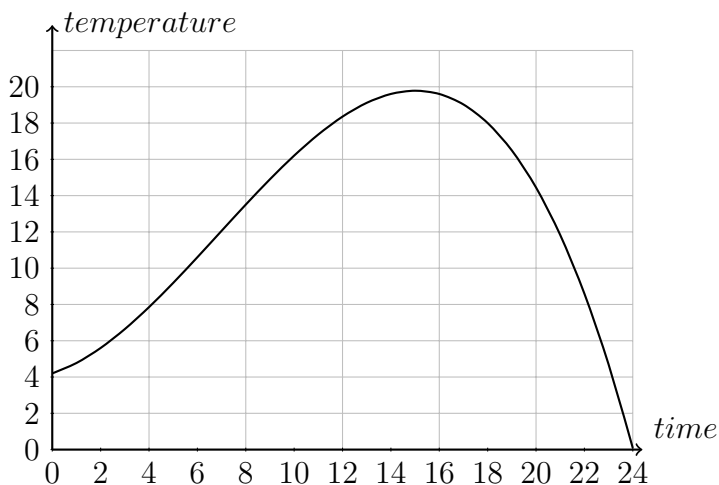
7. A rational function of the form  $f(x) = \frac{1}{x-p} + q$  is shown on the grid below.

- (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  $f(x) = 1$ .



8. The temperature ( $C^\circ$ ) over a 24 hour day starting at midnight is modeled by the function  $f(t) = -0.0073t^3 + 0.15t^2 + 0.43t + 4.2$ .

- (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.



**Linear functions****CCSS.8.F.B.4**

9. A linear function  $f$  is graphed below.

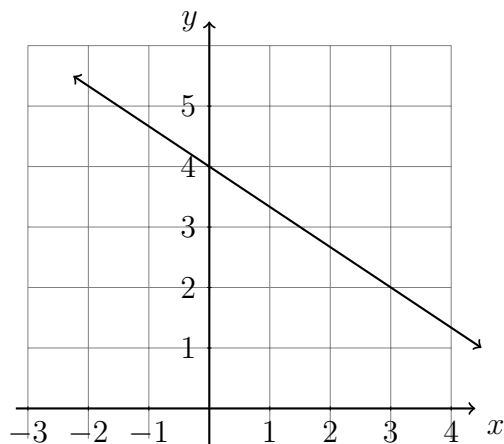
(a) Write down it's slope.

$m =$

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

$b =$

(c) Write down the equation of the line.



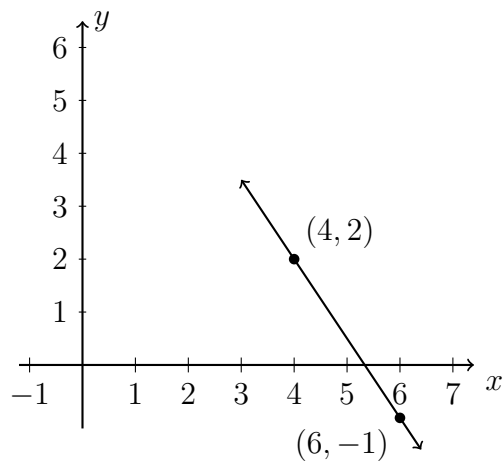
10. Write the linear equation  $y + 5 = 3(x - 2)$  in the form  $y = mx + c$ .

11. A line has a gradient (slope) of  $-\frac{2}{3}$  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  $(4, 2)$  and  $(6, -1)$ .

(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:  $(-4, 6)$ ,  $(-3, 4)$ ,  $(-1, 5)$ ,  $(1, 3)$ ,  $(3, 4)$ ,  $(5, 2)$

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

