

Show all of your work for partial credit.

1. For the function $g(x) = x^2 - x$, setup and simplify the difference quotient $\frac{g(a+h) - g(a)}{h}$.

2. Find all horizontal asymptotes, vertical asymptotes, and holes (if any) for

$$f(x) = \frac{x^2 - 4}{x^2 + x - 6}$$

For holes, find the coordinates of the hole; for the vertical asymptote(s), sketch the details.
SHOW WORK.

3. Find the domain for $g(x) = \frac{3x^2 - 4}{\sqrt{x^2 + x - 6}}$

4. For the function $f(x) = -x^2 + 8x - 9$ complete the square and write the quadratic in the standard (completed square) form.

5. For the function $f(x) = -x^2 + 8x - 9$ find the intercepts and the vertex and sketch the graph.

6. Solve for x in each of the following (list all solutions or state that there are none):

(a) $x^2 = 2 - x$

(b) $x^2 - x < 6$

(c) $\frac{x^2 - 1}{x^2 - x - 6} = 0$

7. Find the equation of the line with x -intercept 3 and which goes through the point (2, 4).

8. Consider the rational function $f(x) = \frac{p(x)}{q(x)}$. The graphs of $p(x)$ and $q(x)$ are shown below:

(a) Is the leading coefficient of $p(x)$ positive or negative and why?

(b) What is the domain of $f(x)$?

(c) What can you say about the degree of $q(x)$ and why?

(d) What is $f(0)$?

(e) Sketch the details of any holes or vertical asymptotes of $f(x)$ on the bottom set of axes. Show your work in the space below.

9. Yesterday there was 10 inches of snow on the ground, today there was 8.3 inches of snow on the ground. If the snow continues to melt so that the depth of the snow decreases linearly, find the linear equation that relates time and depth of snow and use it to determine when the snow will all be melted.

10. A company manufactures and sells x radios per week. The price-demand equation is $p = 10 - 0.001x$ for $0 \leq x \leq 10000$, where p is in dollars. What price should the company set to maximize the revenue?

11. Simplify each of the following into a single fraction (rational) with no negative exponents.

(a) $3x^{-2} + 2x^3 =$

(b) $\frac{1 + \frac{x}{x+3}}{x^3} =$

12. Shirley launches a model rocket over the city from the top of a bluff. The rocket lands somewhere in the town below. The height of the rocket r (in feet) above the town t seconds after launch is given by

$$r(t) = -32t^2 + 400t + 540.$$

(a) How high is the bluff?

(b) How far above the town is the rocket after 2 seconds?

(c) What is the rocket's maximum height above the town?

(d) When does the rocket crash into the town?