
Show all of your work for partial credit.

1. For the function $g(x) = 5x^2 - 3x + 1$, setup and completely simplify the difference quotient $\frac{g(2+h) - g(2)}{h}$.

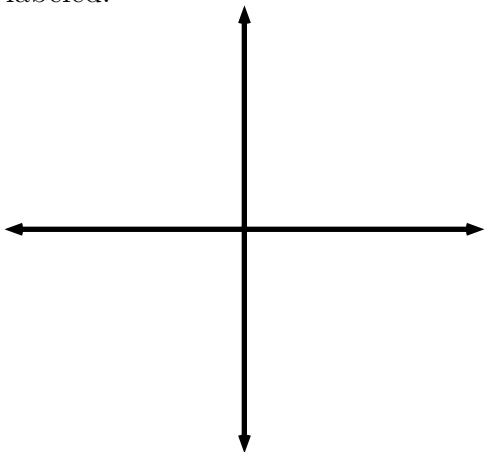
2. Consider the rational function $f(x) = \frac{6 - x - x^2}{x^2 + 4x + 3}$

(a) Find and analyze the details for any vertical asymptotes. Also find any holes and give the coordinates. Show your work.

(b) Find any horizontal asymptotes.

(c) Find x - and y - intercepts.

(d) Sketch the graph of the rational function with all of the above features carefully noted and labeled.



3. What is the domain of $h(x) = \log_2(6 - x - x^2)$? Justify your answer.

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

(a) $x(x + 2) = 15$

(b) $x^2 < 12 - x$

(c) $1000 = 90e^{3x} + 100$

(d) $\log_2(x) + \log_2(x + 2) = 3$

(e) $\frac{x^2 + x - 12}{x^2 + x - 6} = 0$

5. A line goes through the points $(5, 3)$ and $(12, -2)$. Find the equation of the line (slope-intercept form) AND the x - and y - intercepts.

6. Write an equation of a 3^{rd} degree polynomial that has zeros at $-4, 3$, and 5 .

7. A local supplier discovers that at a price of \$3 per widget there will be a demand of 30 widgets, while at a price of \$1.20 per widget there will be a demand of 150 widgets. Assuming price, p , is a linear function of demand, x , find p as a function of x . If the price is \$2 per widget, what will the demand be according to the model?

8. For the quadratic function $f(x) = -4x^2 - 8x - 3$

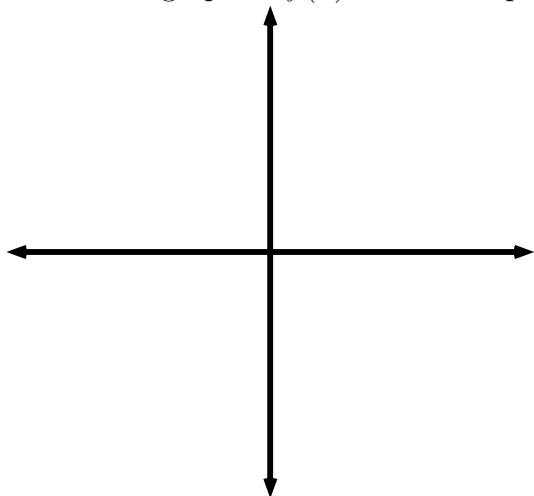
(a) Write the function in vertex form $(a(x - h)^2 + k)$

(b) Give the intercepts

(c) Find the vertex

(d) State the range of $f(x)$

(e) Sketch the graph of $f(x)$ with all important features labeled:



9. A frog leaps upward from a diving board splashing in a pool of water below. The frog's height above the water, in inches, at time t seconds is given by $h(t) = -192t^2 + 60t + 30$.

(a) What is the frog's maximum height above the water? Mathematically justify your answer.

(b) When does the frog strike the water?

10. The parents of a newborn child want to have \$60,000 for the child's college education 17 years from now. At what rate of interest compounded continuously (to three decimal places) must a grandparent's gift of \$20,000 be invested now to achieve this goal?