

1. (5 pts) State whether the relation below represents a function (Yes/No). If not, why or why not? What is the domain and what is the range?

$$\{(1, 1), (-3, -1), (6, 4), (4, -1), (1, 2)\}$$

2. (5 pts) Determine whether the equation  $x - y^2 = 11$  defines  $y$  as a function of  $x$ . If it does *not*, show/explain why not, either by a general argument, or by finding an  $x$ -value in the domain that corresponds to more than one  $y$ -value in the range.

3. (5 pts) Find the domain of  $g(x) = \frac{x^2 + 5x + 17}{\sqrt{2x - 7}}$ .

4. Let  $f(x) = x^2 - 2$ .

a. (5 pts) Simplify the difference quotient  $\frac{f(x+h) - f(x)}{h}$ . You may use the alternative version of this given by  $\frac{f(x) - f(c)}{x - c}$ .

b. (5 pts) Find the average rate of change of  $f$  from  $x = 1$  to  $x = 3$ .

5. Let  $f(x) = x^2 - 3$  and  $g(x) = \sqrt{2x+1}$ .

a. Determine each of the following functions.

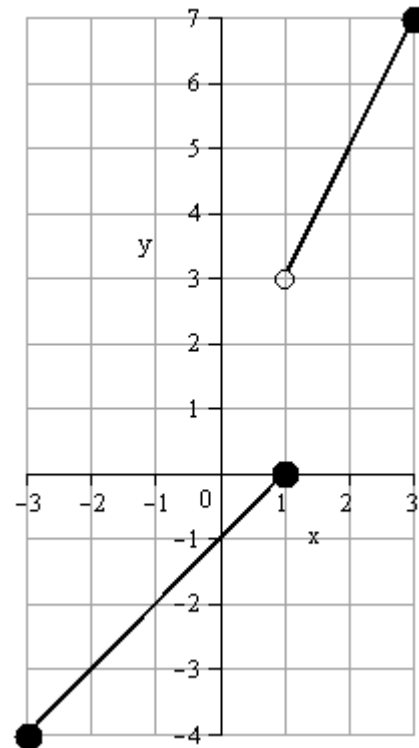
i. (5 pts)  $(f + g)(x)$

ii. (5 pts)  $(f \cdot g)(x)$

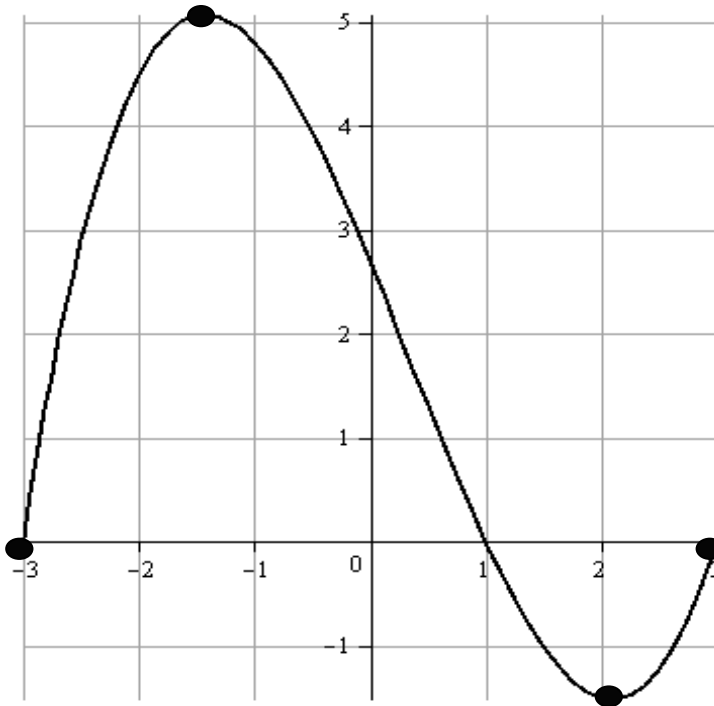
iii. (5 pts)  $\left(\frac{g}{f}\right)(x)$

b. (5 pts) What is the domain of  $\left(\frac{f}{g}\right)(x)$ ?

6. (5 pts) The graph of a piecewise-defined function is given. Write its definition.



7. Use the graph of the function  $f$ , below, to answer the following questions. Some of your answers will be estimates, and that's OK:



a. The intercepts (Express answers as ordered pairs.)

i. (4 pts)  
 $x$ -intercept(s):

ii. (4 pts)  
 $y$ -intercept(s):

b. (5 pts) The domain and range:

c. Intervals of increase/decrease:

i. (3 pts)  $f$  is increasing on \_\_\_\_\_.

ii. (3 pts)  $f$  is decreasing on \_\_\_\_\_.

d. Extrema:

i. (3 pts)  $f$  has local minimum of \_\_\_\_\_ at \_\_\_\_\_.

ii. (3 pts)  $f$  has a local maximum of \_\_\_\_\_ at \_\_\_\_\_.

8. Graph each of the following functions using the techniques of shifting, compressing, stretching, and/or reflecting. Start with the graph of the basic function and show all stages in separate sketches. Track 3 key points through the transformations, and show the  $y$ -intercept in the final sketch.

a. (7 pts)  $g(x) = -\sqrt{x+1} - 7$ . (**2 pts bonus** – Show  $x$ -intercepts in final graph.)

b. (7 pts)  $g(x) = 2(x - 1)^2 - 7$  (**2 pts bonus** – Show  $x$ -intercept(s) in final graph.)

9. (6 pts) Sketch the graph of  $f(x) = \begin{cases} x-1 & \text{if } -2 \leq x < 1 \\ 5 & \text{if } x = 1 \\ 2x+1 & \text{if } x > 1 \end{cases}$ . Include all intercepts.

State the domain and range.