

Given the functions  $f(x) = x^3$ ,  $g(x) = x + 1$ ,  $j(x) = \sqrt{x}$ , and  $p(x) = 3x^2$ , evaluate each combination or composition below:

- |                  |                                  |                      |
|------------------|----------------------------------|----------------------|
| 1. $(p - g)(-1)$ | 5. $p(j(x))$                     | 8. $f(x + h)$        |
| 2. $(jg)(a)$     | 6. $\left(\frac{f}{g}\right)(x)$ | 9. $p(x + h) - p(x)$ |
| 3. $f(p(-2))$    | 7. $p(j(g(x)))$                  |                      |
| 4. $j(p(g(3)))$  |                                  |                      |

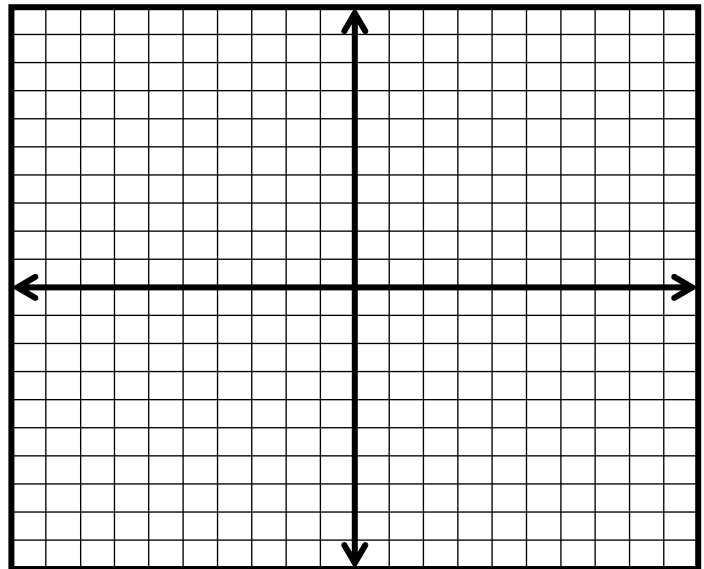
10. Given the composition for the function  $k(x) = \sqrt{(x^2 + 1)}$ , if  $k(x) = f(g(h(x)))$ , then  $g(x) = ?$

11. Find the difference quotient of  $f(x) = 2x^2 - x - 7$ .

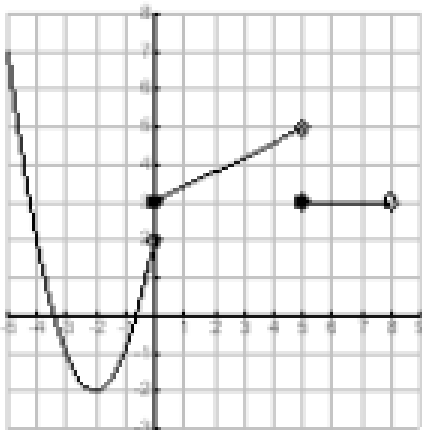
12. Graph the following piecewise function.

$$f(x) = \begin{cases} 4 & -6 < x < -1 \\ x^3 - 3 & -1 < x < 1 \\ \sqrt{x} - 5 & 1 < x \leq 9 \end{cases}$$

- Domain \_\_\_\_\_
- Range \_\_\_\_\_
- $f\left(\frac{1}{2}\right)$  \_\_\_\_\_



13. Write the equation for the piecewise function graphed below.



14. Are the following pairs of functions inverses? Show work to support your answer.

- $f(x) = \frac{x+3}{3}$ ;  $g(x) = 3x - 3$
- $f(x) = \sqrt{x+2} + 3$ ;  $g(x) = x^2 - 6x + 7$

15. For each function below, identify the parent function and any transformations. Then give the domain and range.

a.  $y = \sqrt[3]{x - 5}$

b.  $y = \frac{1}{3}e^{(x+2)}$

c.  $f(x) = \frac{1}{(x+3)} - 5$

d.  $f(x) = 2 \sin(-x) + 3$

e.  $f(x) = \frac{1}{(x-6)^2} - 1$

f.  $y = -x^3 - 2$

16. Give the names and equations of three parent functions whose domain is NOT  $(-\infty, \infty)$ .

17. Give the names and equations of three parent functions that are neither even nor odd.

18. Give the names of three parent functions that are not continuous.

19. Given the following function,  $f(x)$ , answer the following questions.

a. Give the value of  $f(5)$

b. For what value(s) of  $x$  is  $f(x) = -1$

c. Give the interval(s) where the function is decreasing.

d. Give the interval(s) where the function is increasing.

e. Give the domain of  $f(x)$

f. Where does the minimum value occur?

g. What are the local minimum and maximum values of  $f(x)$ ?

h. Is  $(-2)$  positive or negative?

i. For what values of  $x$  is  $f(x) < 0$ ?

