

### 3-5 Practice

#### Transformations of Linear Functions

Write a function  $g(x)$  to represent the translated graph.

1.  $f(x) = 2x + 4$  moves 2 units up.  $g(x) = f(x) + 2 = 2x + 6$
2.  $f(x) = -x - 1$  moves 1 unit up.  $g(x) = -x$
3.  $f(x) = 5x + 8$  moves 2 units down.  $g(x) = 5x + 6$
4.  $f(x) = 2x + 3$  moves 1 unit right.  $g(x) = 2x + 2$
5.  $f(x) = x + 4$  moves 2 units left.  $g(x) = x + 6$
6.  $f(x) = 5x$  moves 3 units right.  $g(x) = 5x - 3$

Describe the graph of each function compared to the graph of  $f(x) = x$ .

7.  $g(x) = \frac{1}{3}x$  less steep  
rotated
8.  $g(x) = 3x$  more steep  
rotated
9.  $g(x) = \frac{5}{2}x$  more steep  
rotated

Write the rule for  $g(x)$ . Describe the effect of the dilation.

10.  $f(x) = 4x$ ;  $g(x) = f\left(\frac{1}{4}\right)x$   
 $g(x) = x$  less steep
11.  $f(x) = 2x + 1$ ;  $g(x) = f(2x)$   
 $g(x) = 4x + 1$  steeper  
rotated
12.  $f(x) = x - 2$ ;  $g(x) = f(3x)$   
 $g(x) = 3x - 2$  steeper  
rotated

Write the rule for  $g(x)$ . Describe the effect of the transformation.

13.  $f(x) = 2x$ ;  $g(x) = -\frac{1}{2}f(x)$   
 $g(x) = -x$  less steep  
reflected
14.  $f(x) = x + 1$ ;  $g(x) = -3f(x)$   
 $g(x) = -3x - 3$  steeper  
reflected
15.  $f(x) = x + 6$ ;  $g(x) = -\frac{1}{3}f(x)$   
 $g(x) = -\frac{1}{3}x - 2$  less steep  
reflected
16.  $f(x) = 4x$ ;  $g(x) = f(-2x)$   
 $g(x) = -8x$  more steep  
reflected
17.  $f(x) = 2x - 3$ ;  $g(x) = f(-x)$   
 $g(x) = -2x - 3$  same steepness  
reflected
18.  $f(x) = 10x + 8$ ;  $g(x) = f\left(-\frac{1}{2}x\right)$   
 $g(x) = -5x + 8$  less steep  
reflected

19. **MUSIC** The function  $f(x) = 2x$  gives the cost in dollars for  $x$  music downloads that cost \$2 each. Write a function  $g(x)$  to represent the cost in dollars for  $x$  music downloads that cost \$1 each. Describe the graph of  $g(x)$  compared to  $f(x)$ .

$g(x) = 1x$   $g(x)$  is less steep than  $f(x)$

20. **SMART SHOPPING** Kyle is buying strands of outdoor lights for his luau. The total cost of the strands can be modeled by the function  $f(s) = 8.97s$ . He received an email with a coupon code to receive \$5 off his online purchase, so the final cost of his purchase can be modeled by  $g(s) = 8.97s - 5$ . Describe the translation of  $f(s)$  that results in  $g(s)$ .

$f(s) = 8.97s$   
 $g(s) = 8.97s - 5$   $g(s)$  is a translation 5 units down

## 3-5 Word Problem Practice

### Transformations of Linear Functions

1. **PERIMETER** The function  $f(s) = 4s$  represents the perimeter of a square with side length  $s$ . Write a function  $g(s)$  to represent the perimeter of a square with side lengths that are twice as great. Describe the graph of  $g(s)$  compared to  $f(s)$ .

$$g(s) = 8s \quad \text{steeper, rotated}$$

2. **BOWLING** The cost for Kendall to go bowling is \$4 per game plus an additional flat fee of \$3.50 for the rental of bowling shoes. The cost can be modeled by the function  $f(x) = 4x + 3.5$ , where  $x$  represents the number of games bowled. Describe the graph of  $g(x)$  if Kendall does not rent bowling shoes.

$$g(x) = 4x \quad \text{translated 3.5 units down}$$

3. **AUTO PAY** Matthew has his auto insurance set up to be automatically deducted from his checking account each month. The balance in his checking account can be modeled by  $f(x) = -85.97x$ , where his payment is \$85.97 per month, and  $x$  represents the number of months he makes payments. If Matthew's monthly automobile insurance payment is decreased to \$80 due to his excellent driving record, describe the graph of  $f(x)$  that results in  $g(x)$ .

$$g(x) = 1.5x \quad \text{steeper \& rotated}$$

4. **SAVINGS** Natalie has \$250 in her savings account, into which she deposits \$10 of her allowance each week. The balance of her savings account can be modeled by the function  $f(w) = 250 + 10w$ , where  $w$  represents the number of weeks. Write a function  $g(w)$  to represent the balance of Natalie's savings account if she withdraws \$40 to purchase a new pair of shoes. Describe the translation of  $f(w)$  that results in  $g(w)$ .

$$g(w) = 210 + 10w \quad \text{translated 40 units down}$$

5. **BOAT RENTAL** The cost to rental a paddle boat at the county park is \$8 per hour plus a non-refundable deposit of \$10. The cost can be modeled by the function  $f(h) = 8h + 10$ , where  $h$  represents the number of hours the boat is rented. Describe the graph of  $g(h)$  if the non-refundable deposit increases to \$15.

$$g(h) = 8h + 15 \quad \text{translated 5 units up}$$

6. **PSYCHOLOGIST** The function  $f(x) = 90x$  gives cost of seeing a psychologist; where \$90 is the psychologist's hourly rate, and  $x$  represents the number of hours spent seeing the psychologist. Describe the dilation,  $g(x)$  of the function  $f(x)$ ,

if the psychologist increases her hourly rate to \$100 per hour.

$$g(x) = 100x \quad \text{steeper \& rotated}$$

7. **PIZZA** Vincenzo's Pizzeria charges \$12 for a large cheese pizza, plus an additional \$1.25 for each additional topping. The function  $f(x) = 12 + 1.25x$  can be used to model the total cost of a large pizza with  $x$  number of toppings. Write a function  $g(x)$  to model the translation of  $f(x)$  if the pizzeria changes the cost of its large cheese pizza to only \$10 for its 5<sup>th</sup> anniversary special. Describe how the graph of  $f(x)$  that results in  $g(x)$ .

$$g(x) = 10 + 1.25x \quad \text{translated down 2}$$