Worksheet: Introduction to Inverse Functions

Multiple Choice
Identify the choice that best completes the statement or answers the question.

1. A pre-paid cellular phone charges $25 for activation and $0.05 per minute. The relation of cost to minutes can be defined by the function $c(x) = 0.05x + 25$. What is the inverse of the function?
   a. $f^{-1}(x) = -20x + 500$
   b. $f^{-1}(x) = \frac{20}{x} + \frac{1}{25}$
   c. $f^{-1}(x) = -0.05x - 25$
   d. $f^{-1}(x) = 20x - 500$

2. Which of the following is the inverse relation to the set of ordered pairs {(-10, 5), (-7, 9), (0, 6), (8, -12)}?
   a. {(5, -10), (9, -7), (6, 0), (-12, 8)}
   b. {(-10, -5), (-7, -9), (0, -6), (8, 12)}
   c. {(10, -5), (7, -9), (0, -6), (-8, 12)}
   d. {(-5, 10), (-9, 7), (-6, 0), (12, -8)}

3. Which of the following is the inverse to the function “Multiply by 8, then subtract 10”?
   a. Add 10, then divide by 8
   b. Subtract 10, then multiply by 8
   c. Divide by 8, then add 10
   d. Multiply by 10, then subtract 8

4. Which of the following is the inverse to the function $f(x) = -8 - 5x$?
   a. $f^{-1}(x) = \frac{1}{5x} - \frac{1}{8}$
   b. $f^{-1}(x) = \frac{x}{5} + \frac{8}{5}$
   c. $f^{-1}(x) = -\frac{x}{5} - \frac{8}{5}$
   d. $f^{-1}(x) = 5x + \frac{8}{5}$

5. A graph of a function is shown.

Which of the following is the graph of the inverse?
6. The Drama Club is holding a car wash to raise money. The club spent $90 on materials and supplies. The club earns $11.25 for each car they wash. Which of the following is the inverse to the function of how much the club earns per cars washed?
   a. \( f^{-1}(x) = \frac{x}{11.25} + 8 \)
   b. \( f^{-1}(x) = \frac{x}{11.25} + 6 \)
   c. \( f^{-1}(x) = 11.25x + 90 \)
   d. \( f^{-1}(x) = \frac{1}{11.25x} - \frac{1}{90} \)

7. Which of the following is the inverse relation to the set of ordered pairs \((-7, 15), (0, -16), (5, 9), (17, -8)\)?
   a. \{(-15, 7), (16, 0), (-9, -5), (8, -17)\}
   b. \{(-7, -15), (0, 16), (5, -9), (17, 8)\}
   c. \{(-15, 7), (16, 0), (-9, -5), (8, -17)\}
   d. \{(15, -7), (-16, 0), (9, 5), (-8, 17)\}

8. Which of the following is the inverse to the function “Divide by 2, then add 21”?
   a. Subtract 21, then multiply by 2
   b. Add 21, then divide by 2
   c. Divide by 21, then add 2
   d. Multiply by 2, then subtract 21

**Short Answer**

9. What is the inverse of the linear function \( f(x) = -10 + 8x \)?

10. For \( h(t) = -6t + \gamma \), determine \( h^{-1}(4) \).
11. Use the graph of the function to draw the graph of the inverse.

Is the inverse a function?

12. A DVD rental company charges $7 per month plus $2.50 for each rental. The relation can be defined by \( c(x) = 2.5x + 7 \). Determine the inverse of the function and what it represents.

13. What is the inverse of the linear function \( \frac{2}{3}x - 5 \)?

14. For \( g(x) = 4 - 9x \), determine \( g^{-1}(-3) \).

15. Use the graph of the function to draw the graph of the inverse.

Is the inverse a function?

16. Ms. Wright wrote the function \( p(x) = 82x - 270 \) to represent her profits from purses sold. Determine the inverse of the function and what it represents.

17. What is the inverse of the linear function \( \frac{x + 7}{4} \)?

18. For \( k(x) = \frac{4}{5}x - \frac{1}{5} \), determine \( k^{-1}(8) \).
Problem

19. The formula for converting a temperature in degrees Fahrenheit into degrees Celsius is $C = \frac{5}{9} (F - 32)$.
   a) Write the formula in function notation.
   b) Write $f^{-1}$ as a rule. What does the rule represent?
c) Use the inverse function to convert 9 °C into degrees Fahrenheit.

**Worksheet: Introduction to Inverse Functions**

**Answer Section**

**MULTIPLE CHOICE**

1. ANS: D  
   PTS: 1  
   OBJ: 1.5 - The Inverse Function and Its Properties  
   REF: Application

2. ANS: A  
   PTS: 1  
   OBJ: 1.5 - The Inverse Function and Its Properties  
   REF: Knowledge and Understanding

3. ANS: A  
   PTS: 1  
   OBJ: 1.5 - The Inverse Function and Its Properties  
   REF: Application

4. ANS: C  
   PTS: 1  
   OBJ: 1.5 - The Inverse Function and Its Properties  
   REF: Knowledge and Understanding

5. ANS: B  
   PTS: 1  
   OBJ: 1.5 - The Inverse Function and Its Properties  
   REF: Application

6. ANS: B  
   PTS: 1  
   OBJ: 1.5 - The Inverse Function and Its Properties  
   REF: Application

7. ANS: D  
   PTS: 1  
   OBJ: 1.5 - The Inverse Function and Its Properties  
   REF: Knowledge and Understanding

8. ANS: B  
   PTS: 1  
   OBJ: 1.5 - The Inverse Function and Its Properties  
   REF: Application

**SHORT ANSWER**

9. ANS:  
   \[ f(x) = \frac{x}{8} + \frac{5}{4} \]  
   PTS: 1  
   REF: Knowledge and Understanding  
   OBJ: 1.5 - The Inverse Function and Its Properties

10. ANS:  
    \[ h^{-1}(4) = \frac{1}{2} \]  
    PTS: 1  
    REF: Application  
    OBJ: 1.5 - The Inverse Function and Its Properties

11. ANS:
Yes, the inverse is a function.

12. \( c^{-1}(x) = \frac{x}{2.5} - \frac{7}{2.5} \) or \( c^{-1}(x) = 0.4x - 2.8 \); the inverse represents the rentals as a function of cost

13. \( f^{-1}(x) = \frac{3}{2} x + \frac{5}{1} \)

14. \( g^{-1}(-3) = \frac{7}{9} \)

15. No, the graph of the inverse is not a function.
PTS: 1  REF: Thinking  OBJ: 1.5 - The Inverse Function and Its Properties

16. ANS:
\[ p^{-1}(x) = \frac{x}{82} + \frac{1350}{41} \]; the inverse represents the purses sold as a function of profits

PTS: 1  REF: Thinking  OBJ: 1.5 - The Inverse Function and Its Properties

17. ANS:
\[ h(\hat{x}) = 4x - 7 \]

PTS: 1  REF: Knowledge and Understanding  OBJ: 1.5 - The Inverse Function and Its Properties

18. ANS:
\[ k^{-1}(8) = 17 \frac{1}{2} \]

PTS: 1  REF: Application  OBJ: 1.5 - The Inverse Function and Its Properties

**PROBLEM**

19. ANS:
\[ f(x) = \frac{5}{9}(x - 32) \]

a) \[ f^{-1}(x) = \frac{9}{5}x + 32 \]

b) \[ f^{-1}(x) = \frac{9}{5}x + 32 \]; the inverse represents the formula to convert degrees Celsius to degrees Fahrenheit

c) 48.2 °F

PTS: 1  REF: Communication  OBJ: 1.5 - The Inverse Function and Its Properties