Chapter Review

Concept Check

1. a. What is a function? What are its domain and range?

   b. What is the graph of a function?

   c. How can you tell whether a given curve is the graph of a function?

2. Discuss four ways of representing a function. Illustrate your discussion with examples.

3. a. What is an even function? How can you tell if a function is even by looking at its graph? Give three examples of an even function.

   b. What is an odd function? How can you tell if a function is odd by looking at its graph? Give three examples of an odd function.

4. What is an increasing function?

5. What is a mathematical model?

6. Give an example of each type of function.

   a. Linear function

   b. Power function

   c. Exponential function

   d. Quadratic function

   e. Polynomial of degree 5

   f. Rational function

7. Sketch by hand, on the same axes, the graphs of the following functions.

   a. $f(x) = x$

   b. $g(x) = x^2$

   c. $h(x) = x^3$

   d. $j(x) = x^4$

8. Draw, by hand, a rough sketch of the graph of each function.

    a. $y = \sin x$

    b. $y = \tan x$

    c. $y = e^x$

    d. $y = \ln x$

    e. $y = 1/x$

    f. $y = |x|$

    g. $y = \sqrt{x}$

    h. $y = \tan^{-1} x$

9. Suppose that f has domain A and g has domain B.

    a. What is the domain of $f + g$?

    b. What is the domain of fg?

    c. What is the domain of f/g?

10. How is the composite function $f \circ g$ defined? What is its domain?

11. Suppose the graph of f is given. Write an equation for each of the graphs that are obtained from the graph of f as follows.

    a. Shift 2 units upward.

    b. Shift 2 units downward.

    c. Shift 2 units to the right.

    d. Shift 2 units to the left.

    e. Reflect about the x-axis.

    f. Reflect about the y-axis.

    g. Stretch vertically by a factor of 2.

    h. Shrink vertically by a factor of 2.

    i. Stretch horizontally by a factor of 2.

    j. Shrink horizontally by a factor of 2.

12. a. What is a one-to-one function? How can you tell if a function is one-to-one by looking at its graph?

b. If f is a one-to-one function, how is its inverse function f^{-1} defined? How do you obtain the graph of f^{-1} from the graph of f?

13. a. How is the inverse sine function $f(x) = \sin^{-1} x$ defined? What are its domain and range?

b. How is the inverse cosine function $f(x) = \cos^{-1} x$ defined? What are its domain and range?

c. How is the inverse tangent function $f(x) = \tan^{-1} x$ defined? What are its domain and range?

True-False Quiz

Determine whether the statement is true or false. If it is true, explain why. If it is false, explain why or give an example that disproves the statement.

1. If f is a function, then $f(s+t) = f(s) + f(t)$.

   True False

2. If $f(s) = f(t)$, then $s = t$.

   True False

3. If f is a function, then $f(3x) = 3f(x)$.

   True False

4. If $x_1 < x_2$ and f is a decreasing function, then $f(x_1) > f(x_2)$.

   True False

5. A vertical line intersects the graph of a function at most once.

   True False

6. If f and g are functions, then $f \circ g = g \circ f$.

   True False

7. If f is one-to-one, then $f^{-1}(x) = \dfrac{1}{f(x)}$.

   True False

8. You can always divide by e^x.

   True False

9. If $0 < a < b$, then $\ln a < \ln b$.

   True False

10. If $x > 0$, then $(\ln x)^6 = 6 \ln x$.

    True False

11. If $x > 0$ and $a > 1$, then $\dfrac{\ln x}{\ln a} = \ln \dfrac{x}{a}$.

    True False

12. $\tan^{-1}(-1) = 3\pi/4$

    True False

13. $\tan^{-1} x = \dfrac{\sin^{-1} x}{\cos^{-1} x}$

    True False

14. If x is any real number, then $\sqrt{x^2} = x$.

    True False

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