Chapter 1 Questions to Guide Your Review

1. How are the real numbers represented? What are the main categories characterizing the properties of the real number system? What are the primary subsets of the real numbers?
2. How are the rational numbers described in terms of decimal expansions? What are the irrational numbers? Give examples.
3. What are the order properties of the real numbers? How are they used in solving equations?
4. What is a number's absolute value? Give examples? How are $|-a|$, $|ab|$, $|a/b|$, and $|a + b|$ related to $|a|$ and $|b|$?
5. How are absolute values used to describe intervals or unions of intervals? Give examples.
6. How do we identify points in the plane using the Cartesian coordinate system? What is the graph of an equation in the variables x and y?
7. How can you write an equation for a line if you know the coordinates of two points on the line? The line's slope and the coordinates of one point on the line? The line's slope and y-intercept? Give examples.
8. What are the standard equations for lines perpendicular to the coordinate axes?
9. How are the slopes of mutually perpendicular lines related? What about parallel lines? Give examples.
10. When a line is not vertical, what is the relation between its slope and its angle of inclination?
11. How do you find the distance between two points in the coordinate plane?
12. What is the standard equation of a circle with center (h, k) and radius a? What is the unit circle and what is its equation?
13. Describe the steps you would take to graph the circle $x^2 + y^2 + 4x - 6y + 12 = 0$.
14. What inequality describes the points in the coordinate plane that lie inside the circle of radius a centered at the point (h, k)? That lie inside or on the circle? That lie outside the circle? That lie outside or on the circle?
15. If a, b, and c are constants and $a \neq 0$, what can you say about the graph of the equation $y = ax^2 + bx + c$? In particular, how would you go about sketching the curve $y = 2x^2 + 4x$?
16. What is a function? What is its domain? Its range? What is an arrow diagram for a function? Give examples.
17. What is the graph of a real-valued function of a real variable? What is the vertical line test?
18. What is a piecewise-defined function? Give examples.
19. What are the important types of functions frequently encountered in calculus? Give an example of each type.
20. In terms of its graph, what is meant by an increasing function? A decreasing function? Give an example of each.
21. What is an even function? An odd function? What symmetry properties do the graphs of such functions have? What advantage can we take of this? Given an example of a function that is neither even nor odd.
22. What does it mean to say that y is proportional to x? To $x^{3/2}$? What is the geometric interpretation of proportionality? How can this interpretation be used to test a proposed proportionality?
23. If f and g are real-valued functions, how are the domains of $f + g$, $f - g$, fg, and f/g related to the domains of f and g? Give examples.
24. When is it possible to compose one function with another? Give examples of composites and their values at various points. Does the order in which functions are composed ever matter?
25. How do you change the equation $y = f(x)$ to shift its graph vertically up or down by a factor $k > 0$? Horizontally to the left or right? Give examples.
26. How do you change the equation $y = f(x)$ to compress or stretch the graph by $c > 1$? Reflect the graph across a coordinate axis? Give examples.
27. What is the standard equation of an ellipse with center (h, k)? What is its major axis? Its minor axis? Give examples.
28. What is radian measure? How do you convert from radians to degrees? Degrees to radians?
29. Graph the six basic trigonometric functions. What symmetries do the graphs have?
30. What is a periodic function? Give examples. What are the periods of the six basic trigonometric functions?

31. Starting with the identity $\sin^2\theta + \cos^2\theta = 1$ and the formulas for $\cos(A + B)$ and $\sin(A + B)$, show how a variety of other trigonometric identities may be derived.

32. How does the formula for the general sine function $f(x) = A\sin((2\pi/B)(x - C)) + D$ relate to the shifting, stretching, compressing, and reflection of its graph? Give examples. Graph the general sine curve and identify the constants A, B, C, and D.

33. Name three issues that arise when functions are graphed using a calculator or computer with graphing software. Give examples.