Exercises for Section 3.9

The symbol indicates an exercise in which you are instructed to use graphing technology or a symbolic computer algebra system.

Click on S to view the complete solution of the exercise.

Click on M to print an enlarged copy of the graph.

In Exercises 1–6, find the equation of the tangent line T to the graph of f at the given point. Use this linear approximation to complete the table.

x	1.9	1.99	2	2.01	2.1
$f(x)$					
$T(x)$					

1. $f(x) = x^2, \quad (2, 4)$
2. $f(x) = \dfrac{6}{x^2}, \quad \left(2, \dfrac{3}{2}\right)$
3. $f(x) = x^5, \quad (2, 32)$
4. $f(x) = \sqrt{x}, \quad (2, \sqrt{2})$
5. $f(x) = \sin x, \quad (2, \sin 2)$
6. $f(x) = \csc x, \quad (2, \csc 2)$

In Exercises 7–10, use the information to evaluate and compare Δy and dy.

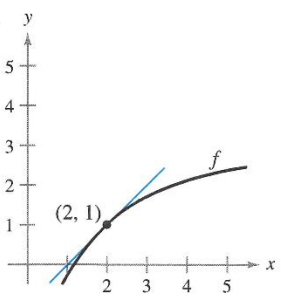
7. $y = \frac{1}{2}x^3 \qquad x = 2 \qquad \Delta x = dx = 0.1$
8. $y = 1 - 2x^2 \qquad x = 0 \qquad \Delta x = dx = -0.1$
9. $y = x^4 + 1 \qquad x = -1 \qquad \Delta x = dx = 0.01$
10. $y = 2x + 1 \qquad x = 2 \qquad \Delta x = dx = 0.01$

In Exercises 11–20, find the differential dy of the given function.

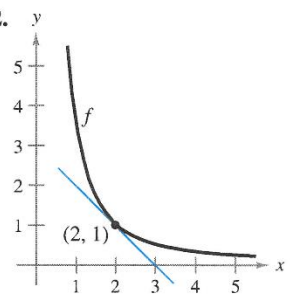
11. $y = 3x^2 - 4$
12. $y = 3x^{2/3}$
13. $y = \dfrac{x + 1}{2x - 1}$
14. $y = \sqrt{9 - x^2}$
15. $y = x\sqrt{1 - x^2}$
16. $y = \sqrt{x} + \dfrac{1}{\sqrt{x}}$
17. $y = 2x - \cot^2 x$
18. $y = x \sin x$
19. $y = \dfrac{1}{3}\cos\left(\dfrac{6\pi x - 1}{2}\right)$
20. $y = \dfrac{\sec^2 x}{x^2 + 1}$

In Exercises 21–24, use differentials and the graph of f to approximate (a) $f(1.9)$ and (b) $f(2.04)$. To print an enlarged copy of the graph, select the MathGraph button.

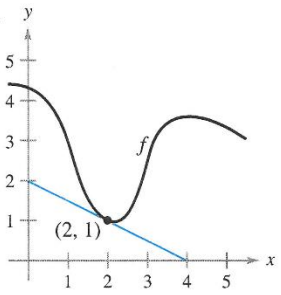
21.



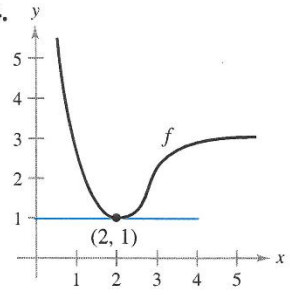
22.



23.

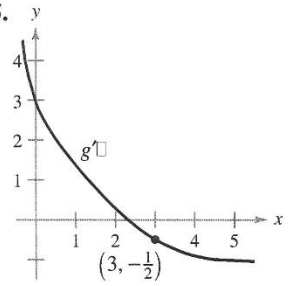


24.

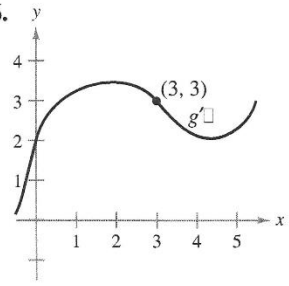


In Exercises 25 and 26, use differentials and the graph of g' to approximate (a) $g(2.93)$ and (b) $g(3.1)$ given that $g(3) = 8$.

25.



26.



27. ***Area*** The measurement of the side of a square is found to be 12 inches, with a possible error of $\frac{1}{64}$ inch. Use differentials to approximate the possible propagated error in computing the area of the square.

28. ***Area*** The measurements of the base and altitude of a triangle are found to be 36 and 50 centimeters, respectively. The possible error in each measurement is 0.25 centimeter. Use differentials to approximate the possible propagated error in computing the area of the triangle.

29. ***Area*** The measurement of the radius of the end of a log is found to be 14 inches, with a possible error of $\frac{1}{4}$ inch. Use differentials to approximate the possible propagated error in computing the area of the end of the log.

30. ***Volume and Surface Area*** The measurement of the edge of a cube is found to be 12 inches, with a possible error of 0.03 inch. Use differentials to approximate the maximum possible propagated error in computing (a) the volume of the cube and (b) the surface area of the cube.

31. ***Area*** The measurement of a side of a square is found to be 15 centimeters, with a possible error of 0.05 centimeter.
   (a) Approximate the percent error in computing the area of the square.
   (b) Estimate the maximum allowable percent error in measuring the side if the error in computing the area cannot exceed 2.5%.

32. ***Circumference*** The measurement of the circumference of a circle is found to be 56 inches, with a possible error of 1.2 inches.
   (a) Approximate the percent error in computing the area of the circle.