24. Let $f(x) = x^2 + 6x$.
   a. Find the derivative f' of f.
   b. Find the point on the graph of f where the tangent line to the curve is horizontal.
   Hint: Find the value of x for which $f'(x) = 0$.
   c. Sketch the graph of f and the tangent line to the curve at the point found in part (b).

25. Let $f(x) = x^2 - 2x + 1$.
   a. Find the derivative f' of f.
   b. Find the point on the graph of f where the tangent line to the curve is horizontal.
   c. Sketch the graph of f and the tangent line to the curve at the point found in part (b).
   d. What is the rate of change of f at this point?

26. Let $f(x) = \dfrac{1}{x - 1}$.
   a. Find the derivative f' of f.
   b. Find an equation of the tangent line to the curve at the point $\left(-1, -\frac{1}{2}\right)$.
   c. Sketch the graph of f and the tangent line to the curve at $\left(-1, -\frac{1}{2}\right)$.

27. Let $y = f(x) = x^2 + x$.
   a. Find the average rate of change of y with respect to x in the interval from $x = 2$ to $x = 3$, from $x = 2$ to $x = 2.5$, and from $x = 2$ to $x = 2.1$.
   b. Find the (instantaneous) rate of change of y at $x = 2$.
   c. Compare the results obtained in part (a) with the result of part (b).

28. Let $y = f(x) = x^2 - 4x$.
   a. Find the average rate of change of y with respect to x in the interval from $x = 3$ to $x = 4$, from $x = 3$ to $x = 3.5$, and from $x = 3$ to $x = 3.1$.
   b. Find the (instantaneous) rate of change of y at $x = 3$.
   c. Compare the results obtained in part (a) with the result of part (b).

29. **Velocity of a Car** Suppose the distance s (in feet) covered by a car moving along a straight road after t sec is given by the function $s = f(t) = 2t^2 + 48t$.
   a. Calculate the average velocity of the car over the time intervals $[20, 21]$, $[20, 20.1]$, and $[20, 20.01]$.
   b. Calculate the (instantaneous) velocity of the car when $t = 20$.
   c. Compare the results of part (a) with the result of part (b).

30. **Velocity of a Ball Thrown into the Air** A ball is thrown straight up with an initial velocity of 128 ft/sec, so that its height (in feet) after t sec is given by $s(t) = 128t - 16t^2$.
   a. What is the average velocity of the ball over the time intervals $[2, 3]$, $[2, 2.5]$, and $[2, 2.1]$?
   b. What is the instantaneous velocity at time $t = 2$?
   c. What is the instantaneous velocity at time $t = 5$? Is the ball rising or falling at this time?
   d. When will the ball hit the ground?

31. **Velocity of a Falling Object** During the construction of a high-rise building, a worker accidentally dropped his portable electric screwdriver from a height of 400 ft. After t sec, the screwdriver had fallen a distance of $s = 16t^2$ ft.
   a. How long did it take the screwdriver to reach the ground?
   b. What was the average velocity of the screwdriver between the time it was dropped and the time it hit the ground?
   c. What was the velocity of the screwdriver at the time it hit the ground?

32. **Velocity of a Hot-Air Balloon** A hot-air balloon rises vertically from the ground so that its height after t sec is $h = \frac{1}{2}t^2 + \frac{1}{2}t$ ft $(0 \le t \le 60)$.
   a. What is the height of the balloon at the end of 40 sec?
   b. What is the average velocity of the balloon between $t = 0$ and $t = 40$?
   c. What is the velocity of the balloon at the end of 40 sec?

33. At a temperature of 20°C, the volume V (in liters) of 1.33 g of O_2 is related to its pressure p (in atmospheres) by the formula $V = 1/p$.
   a. What is the average rate of change of V with respect to p as p increases from $p = 2$ to $p = 3$?
   b. What is the rate of change of V with respect to p when $p = 2$?

34. **Cost of Producing Surfboards** The total cost $C(x)$ (in dollars) incurred by Aloha Company in manufacturing x surfboards a day is given by
$$C(x) = -10x^2 + 300x + 130 \qquad (0 \le x \le 15)$$
   a. Find $C'(x)$.
   b. What is the rate of change of the total cost when the level of production is ten surfboards a day?

35. **Effect of Advertising on Profit** The quarterly profit (in thousands of dollars) of Cunningham Realty is given by
$$P(x) = -\frac{1}{3}x^2 + 7x + 30 \qquad (0 \le x \le 50)$$
where x (in thousands of dollars) is the amount of money Cunningham spends on advertising per quarter.
   a. Find $P'(x)$.
   b. What is the rate of change of Cunningham's quarterly profit if the amount it spends on advertising is \$10,000/quarter $(x = 10)$ and \$30,000/quarter $(x = 30)$?

36. **Demand for Tents** The demand function for Sportsman 5×7 tents is given by
$$p = f(x) = -0.1x^2 - x + 40$$
where p is measured in dollars and x is measured in units of a thousand.
   a. Find the average rate of change in the unit price of a tent if the quantity demanded is between 5000 and 5050 tents; between 5000 and 5010 tents.
   b. What is the rate of change of the unit price if the quantity demanded is 5000?