Homework 14.3

Tangent Lines and Derivatives

#1-3 Find the slope of the tangent line to the graph of f at the given point.

1. $f(x) = 3x + 4 \quad at\ (1, 7)$
2. $f(x) = 5 - 2x \quad at\ (-3, 11)$
3. $f(x) = \frac{6}{x+1} \quad at\ (2, 2)$

#4-6 Find an equation of the tangent line to the curve at the given point. Graph the curve and the tangent line.

4. $y = 2x - x^3 \quad at\ (1, 1)$
5. $y = \sqrt{x + 3}\ at\ (1, 2)$
6. $y = \sqrt{1 + 2x}\ at\ (4, 3)$

#7-9 Find the derivative of the function at the given number.

7. $f(x) = 2 - 3x + x^2 \quad at - 1$
8. $g(x) = 2x^2 + x^3\ at\ 1$
9. $F(x) = \frac{1}{\sqrt{x}}\ at\ 4$

#10-12 Find $f'(a)$, where a is in the domain of f.

10. $f(x) = x^2 + 2x$
11. $f(x) = -\frac{1}{x^2}$
12. $f(x) = \frac{x}{x+1}$

13. **Velocity of a Ball** If a ball is thrown into the air with a velocity of 40 ft/s, its height (in feet) after t seconds is given by $y = 40t - 16t^2$. Find the velocity when $t = 2$.

14. **Velocity on the Moon** If an arrow is shot upward on the moon with a velocity of 58 m/s, its height (in meters) after t seconds is given by $H = 58t - 0.83t^2$
    a. Find the velocity of the arrow after one second.
    b. Find the velocity of the arrow when $t = a$.
    c. At what time t will the arrow hit the moon?
    d. With what velocity will the arrow hit the moon?

15. **Inflating a Balloon** A spherical balloon is being inflated. Find the rate of change of the surface area ($S = 4\pi r^2$) with respect to the radius r when $r = 2\ ft$.