11. $y = -6 \sin 3x$

12. $f(x) = 4 \cos(-5x)$

13. $\dfrac{d}{dx}(\cos^4 7x)$

14. $\dfrac{d}{dx}(\sin^9 13x)$

15. $f(x) = 24 \sin^{5/3} 4x$

16. $f(x) = -100 \sin^{6/5}(-9x)$

17. $f(x) = (5x + 3)^7$

18. $f(x) = (x^2 + 8)^9$

19. $y = (4x^3 - 7)^{-6}$

20. $y = (x^2 + 3x - 7)^{-5}$

21. $y = [\cos(x^2 + 3)]^{100}$

22. $y = [\cos(5x + 3)^4]^5$

23. Find $\dfrac{d^2y}{dx^2}$ if $y = 4 \cos 5x$.

24. Find $\dfrac{d^2y}{dx^2}$ if $y = 7 \sin(2x + 5)$.

25. If $f'(x) = \cos 5x$, find an antiderivative $f(x)$.

26. If $f'(x) = 10 \sin 2x$, find an antiderivative $f(x)$.

27. *Graphical Verification Problem:* For $f(x) = 5 \cos 0.2x$, plot the graph of function f. Where $x = 3$, plot a line on the graph with slope equal to $f'(3)$. Is the line really tangent to the graph?

28. *Beanstalk Problem:* Jack's beanstalk grows in spurts. Its height, y, in feet above the ground, at time t, in hours since he planted it, is given by

$$y = 7 \sin \pi t + 12t^{1.2}$$

Write an equation for dy/dt. Plot the graph of y and the velocity graph on the same screen. Use a window with $[0, 10]$ for t. Do there appear to be times when the beanstalk is shrinking? Justify your answer.

29. *Balloon Volume Problem:* A spherical balloon is being inflated with air (see Figure 3-7c). The volume of the sphere depends on the radius, and the radius depends on time. Thus, the volume is a composite function of time.

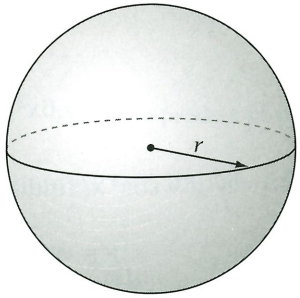

Figure 3-7c

a. The volume of a sphere is $V = (4\pi/3)r^3$, where r is the radius in cm. Find an equation for dV/dr. What are the units of dV/dr?

b. At time $t = 0$, the radius is 10 cm. If r increases at 6 cm/min, write r as a function of t.

c. Find an equation for dr/dt. Surprising? What are the units of dr/dt?

d. By appropriate use of the chain rule, find dV/dt when $t = 5$ min. Based on the units of dV/dr and dr/dt, explain why the units of dV/dt are cm^3/min.

e. Find dV/dt directly by substituting r from part b into the equation for V. Show that you get the same answer you did in part d for dV/dt when $t = 5$.

30. *Δu and Δx Problem:* The derivation of the chain rule states that if u is a continuous function of x, then $\Delta x \to 0$ implies $\Delta u \to 0$.

a. Sketch a graph showing that this may not be true if u has a step discontinuity.

b. Sketch a graph showing why this is true if u is continuous.