

Honors Calculus

Related Rates

Solve. Include units of measure with the answer.

1. Given: $xy = 12$ and $dy/dt = 3$ m/sec. Find dx/dt when $x = 2$.
2. Given: $y = x^3 + 2x$ and $dx/dt = 4$ m/sec. Find dy/dt when $y = 12$
3. The area of a circle is decreasing at a rate of $24 \text{ cm}^2/\text{min}$. At what rate is the radius changing when the radius is 3 cm ?
4. The radius of a circle is increasing at a rate of $5 \text{ cm}/\text{sec}$. At what rate is the area changing when the radius is 12 cm ?
5. The circumference of a circle is decreasing at a rate of $6 \text{ in}/\text{min}$. At what rate is the radius changing ?
6. A cube is expanding at a rate of $4 \text{ cm}^3/\text{min}$. At what rate is an edge increasing when an edge is 6 cm ?
7. The surface area of a cube is decreasing at a rate of $9 \text{ cm}^2/\text{min}$. At what rate is an edge of the cube decreasing when an edge is 5 cm ?
8. The radius of a sphere is expanding at a rate of $12 \text{ in}/\text{min}$. Determine the rate at which the volume is changing when $r = 8 \text{ in}$.
9. The surface area of a sphere is decreasing at a rate of $8 \text{ cm}^2/\text{min}$. Determine the rate at which the radius is changing when the surface area is 32π square centimeters.
10. A 10-ft ladder is leaning against a vertical wall with its other end on the ground. The top end of the ladder is sliding down the wall. When the top end is 6 feet from the ground, it is sliding down at $2 \text{ ft}/\text{sec}$. How fast is the bottom moving away from the wall at this instant?
11. A 10-ft ladder is leaning against a vertical wall with its other end on the ground. The bottom of the ladder is sliding away from the wall at a rate of $0.5 \text{ ft}/\text{sec}$. At what rate is the angle formed by the ladder and the wall changing when the bottom of the ladder is 6 ft from the wall?
- *12. A right cylinder's height increases at a rate of $3 \text{ in}/\text{min}$ and the radius decreases at a rate of $2 \text{ in}/\text{min}$. Find the rate at which the volume is changing when the radius is 4 in and the height is 12 in .

Answers

- 1 -1 m/sec
- 2 56 m/sec
- 3 $-4/\pi$ cm/sec
- 4 120π square cm/sec
- 5 $-3/\pi$ in/min
- 6 $1/27$ in/min
- 7 $-3/20$ cm/min
- 8 3072π cubic inches/min
- 9 $\frac{-1}{(2\sqrt{2})\pi}$ cm/min
- 10 $3/2$ ft/sec
- 11 $1/16$ rad/sec
- 12 -144π cubic inches/min