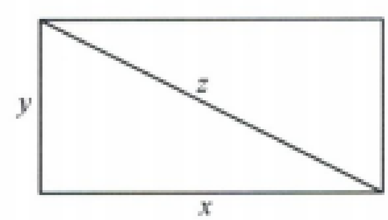
Related Rates Steps

- 1) Make a simple sketch, if possible
- 2) Identify what rate you are looking for
- 3) Set up an equation relating ALL of the relevant quantities
- 4) Differentiate both sides of the equation in terms of the variable you want
  - if you want dv/dt, you differentiate in terms of t
- 5) Substitute in values we know
- 6) Solve for the remaining rate

_____1. The volume of a cone of radius r and height h is given by $V = \frac{1}{3}\pi r^2 h$. If the radius and the height both increase at a constant rate of ½ centimeter per second, at what rate, in cubic centimeters per second, is the volume increasing when the height is 9 centimeters and the radius is 6 centimeters?

(A) $\frac{1}{2}\pi$ (B) 10π (C) 24π (D) 54π (E) 108π



_____2. The sides of the rectangle above increase in such a way that $\frac{dz}{dt} = 1$ and $\frac{dx}{dt} = 3\frac{dy}{dt}$. At the instant when $x = 4$ and $y = 3$, what is the value of $\frac{dx}{dt}$?

(A) $\frac{1}{3}$ (B) 1 (C) 2 (D) $\sqrt{5}$ (E) 5

_____3. The top of a 25-foot ladder is sliding down a vertical wall at a constant rate of 3 feet per minute. Wher the top of the ladder is 7 feet from the ground what is the rate of change of the distance between the bottom of the ladder and the wall?

(A) $-\frac{7}{8}$ feet per minute (B) $-\frac{7}{24}$ feet per minute

(C) $\frac{7}{24}$ feet per minute (D) $\frac{7}{8}$ feet per minute

(E) $\frac{21}{25}$ feet per minute

Bikes A and B are traveling on perpendicular roads. At the same time, bike A is leaving the intersection at a rate of 2 feet per second and bike B is leaving the intersection at 3 feet per second. How fast is the distance, in feet per second, between them changing after 5 seconds?

(A) $-\frac{13}{5}$ (B) $\frac{13}{5}$ (C) $\sqrt{13}$

(D) $\frac{13\sqrt{5}}{5}$ (E) $5\sqrt{13}$

A camera is filming the progress as a daredevil attempts to scale the wall of a skyscraper. The climber is moving vertically at a constant rate of 16 feet per minute, and the camera is 400 feet from the base of the skyscraper. Through how many radians per minute is the camera angle changing when the climber is 300 feet up the building?

(A) $\frac{1}{625}$ (B) $\frac{1}{320}$ (C) $\frac{16}{625}$

(D) $\frac{1}{20}$ (E) $\frac{3}{5}$

A cube has an edge of 40 feet at $t = 0$, and the edge is decreasing at a constant rate of 4 feet per minute. After 2 minutes, the rate of change of the volume in cubic feet per minute is

(A) 384 (B) 480 (C) 6400

(D) 12,288 (E) 19,200

In a rectangle, the length is increasing at constant rate of 3.02 centimeters per second, while the width is decreasing at a constant rate of 0.62 centimeters per second. At the time that the length is 2 centimeters and the width is 0.4, the rate of change of the area is

(A) -0.032 (B) -1.8724 (C) 1.8724

(D) 2.448 (E) 5.792