4.5b / Practice workbook

Related Rates: Similar Triangles

Practice

Problems 1–6 / Show your reasoning

1 A water tank is a cone, point down, with radius 6 ft at the rim and height 12 ft. Water is pumped in at 9π ft^3/min. How fast is the water level rising when the water is 6 ft deep?

2 A 6 ft person walks toward an 18 ft lamppost at 4 ft/s. How fast is the length of the person's shadow changing?

A. -2 ft/s
B. 2 ft/s
C. -6 ft/s
D. $-\frac{4}{3}$ ft/s

4.5b / AP-style free response

Problem 3 ➤ */ Show the work and the reasons a grader looks for.*

A trough is 10 ft long. Its ends are triangles, point down, 4 ft across the top and 2 ft deep. Water flows in at 5 ft^3/min.

(a) Show that the volume of water is $V = 10h^2$ when the water is h ft deep.

(b) How fast is the water level rising when the water is $\frac{1}{2}$ ft deep?

4 Sand falls onto a pile shaped like a cone whose height always equals its radius. Sand is added at 25π ft^3/min. How fast is the height increasing when the pile is 5 ft high?

A. $\frac{1}{5}$ ft/min
B. 1 ft/min
C. 3 ft/min
D. 5 ft/min

4.5b / AP-style free response

Problem 5 ➤ */ Show the work and the reasons a grader looks for.*

A conical cup, point down, has radius 2 in at the rim and height 6 in. Water drains out at 2 in^3/s.

(a) How fast is the water level changing when the water is 3 in deep?

(b) At that moment, how fast is the radius of the water's surface changing?

4.5b / AP-style free response

Problem 6 ➤ */ Show the work and the reasons a grader looks for.*

A cone of sand has radius 3 ft and height 4 ft. Its radius is increasing at 2 ft/min and its height is decreasing at 1 ft/min. Find the rate of change of its volume.

4.5b / Answer key

Related Rates: Similar Triangles

1 1 ft/min

2 (A)

3 (a) shown; (b) $\frac{1}{2}$ ft/min

4 (B)

5 (a) $-\frac{2}{\pi}$ in/s; (b) $-\frac{2}{3\pi}$ in/s

6 13π ft^3/min (increasing)