

AP Calculus AB - Related Rates - Test

Common Core AP CALC AB 4.4 · maths-pdf.fr/en/

Name: _____ Class: _____ Date: ____/____/____

This test checks related rates problems with circles, spheres, cones, ladders, shadows and right triangles (AP Calculus AB, 4.4). It has 8 questions worth 20 points in total. Allow 45 minutes, work without notes, and show all work, since justification earns points on the AP exam.

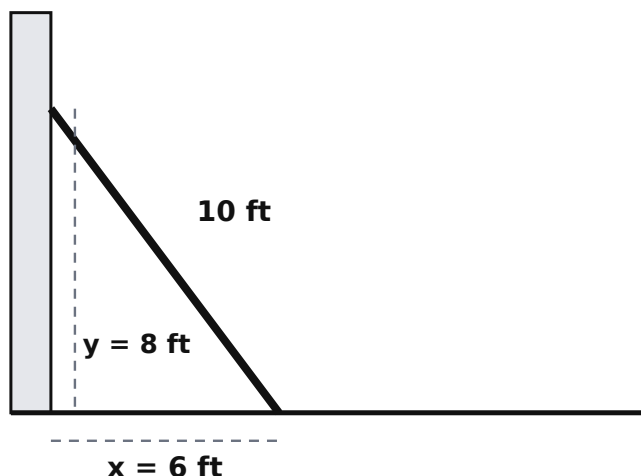
About this test

- Grade: AP Calculus AB
- Chapter: Related Rates
- Standards: AP CALC AB 4.4
- Time: 45 minutes
- Total: 20 points

Question 1 - Circle area [2 pts]

The radius of a circular puddle grows at 0.5 cm/s. How fast is the area growing when $r = 12$ cm?

Question 2 - Ladder [3 pts]



A 10-foot ladder with its base 6 feet from the wall.

A 10-ft ladder leans against a wall. The top slides down at 1.5 ft/s. How fast is the base moving away from the wall when the base is 6 ft from the wall?

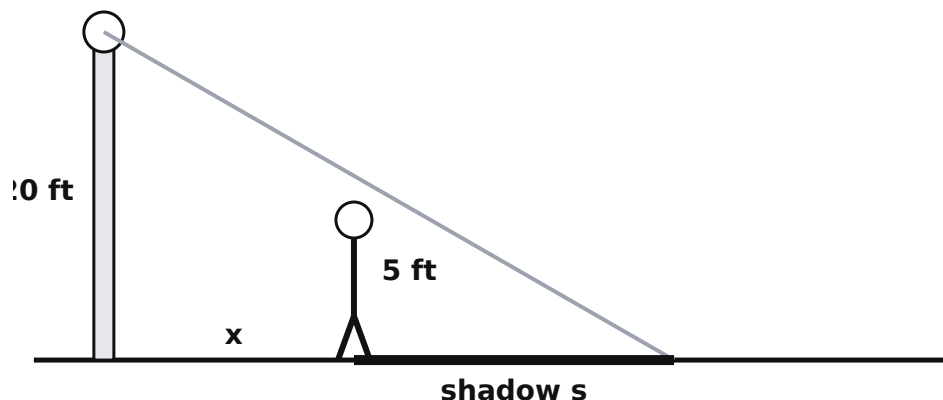
Question 3 - Cone volume [3 pts]

Water drains from a cone-shaped tank (point down) with radius 4 ft and height 8 ft at 6 ft³/min. How fast is the water level falling when the depth is 4 ft?

Question 4 - Rectangle [2 pts]

A rectangle's length increases at 4 cm/s and its width decreases at 1 cm/s. At the moment when the length is 10 cm and the width is 6 cm, how fast is the area changing?

Question 5 - Shadow [3 pts]



A 20-foot light and a 5-foot person.

A 5-ft person walks away from a 20-ft lamppost at 6 ft/s. How fast is the length of the shadow increasing?

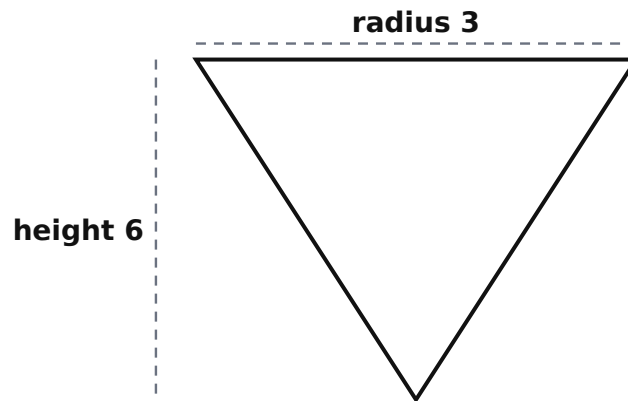
Question 6 - Distance between boats [2 pts]

Boat A sails east at 12 mph and boat B sails south at 5 mph from the same dock. How fast is the distance between them growing after 1 hour?

Question 7 - Angle change [2 pts]

A runner moves along a straight track 50 m from a camera at 8 m/s. Let θ be the angle between the camera's line to the runner and the line perpendicular to the track. Find $\frac{d\theta}{dt}$ when the runner is at the point 50 m along the track (so $\theta = \frac{\pi}{4}$).

Question 8 - Sphere and cylinder [3 pts]



A cone-shaped paper cup.

A spherical balloon's radius grows at 0.2 cm/s. (a) How fast is its volume growing when $r = 10$? (1 point) (b) How fast is its surface area $S = 4\pi r^2$ growing at that moment? (1 point) (c) Which is larger numerically, and why might that be? (1 point)