

Name _____ No Calculators. Present neatly. Score _____.

1.

The radius of a right circular cylinder is increasing at a rate of 2 in/min and the height is decreasing at a rate of 3 in/min . At what rate is the volume changing when the radius is 8 in and the height is 12 in ? Is the volume increasing or decreasing?

2.

A train, starting at 11am, travels east at 45 mph while another, starting at noon from the same point, travels south at 60 mph . How fast are they separating at 3pm?

3.

Find a point on the graph of $y = e^{3x}$ at which the tangent line passes through the origin.

Your work:

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1.

A beacon that makes one revolution every 10 seconds is located on a ship anchored 4 km from a straight shoreline. How fast is the beam moving along the shoreline when it makes an angle of 45° with the shore?

2.

Water is being withdrawn from a conical reservoir 3 feet in radius and 10 feet deep at a rate of $4 \text{ ft}^3/\text{min}$. How fast is the surface falling when the depth of the water is 6 feet? How fast is the area of the surface decreasing at this instant?

3.

Find the value of b so that the line $y = x$ is tangent to the graph of $y = \log_b x$. Confirm your result by graphing both $y = x$ and $y = \log_b x$ in the same coordinate system.

Your work:
