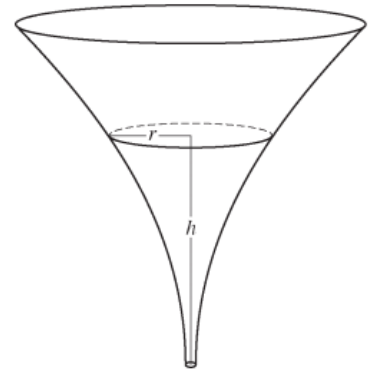


Name:
Teacher:
Period:
Due Date:

Alfa

The inside of a funnel of height 10 inches has circular cross sections, as shown in the figure to the right. At height h , the radius of the funnel is given by $r = \frac{1}{20}(3 + h^2)$, where $0 \leq h \leq 10$. The units of r and h are inches.



- a. The funnel contains liquid that is draining from the bottom. At the instant when the height of the liquid is $h = 3$ inches, the radius of the surface of the liquid is decreasing at a rate of $\frac{1}{5}$ inch per second. At this instant, what is the rate of change of the height of the liquid with respect to time?

Bravo

For $t \geq 0$, a particle moves along the x -axis. The velocity of the particle at time t is given by $v(t) = 1 + 2 \sin\left(\frac{t^2}{2}\right)$. The particle is at position $x = 2$ at time $t = 4$.

- a. At time $t = 4$, is the particle speeding up or slowing down?
b. Find all times t in the interval $0 < t < 3$ when the particle changes directions. Justify your answer.
c. Use a Left Riemann Sum to approximate $\int_0^4 v(t) dt$ using 8 subintervals.

Charlie

Consider the curve given by the equation $y^3 - xy = 2$. It can be shown that $\frac{dy}{dx} = \frac{y}{3y^2 - x}$

- a. Write an equation for the line tangent to the curve at the point $(-1, 1)$.
b. Find the coordinates of all points on the curve at which the line tangent to the curve at that point is vertical.
c. Evaluate $\frac{d^2y}{dx^2}$ at the point on the curve where $x = -1$ and $y = 1$