

Show all work. Arithmetic expressions do not need to be simplified in your final answer.

1. **(8 points)** An industrial gravel crusher is pouring gravel out at a rate of 2 cubic meters per second, forming a conical pile whose height is twice its radius. If the pile is currently 10 meters high, how quickly is its height increasing? (Note that a cone of radius r and height h has volume $\frac{1}{3}\pi r^2 h$.)
2. **(6 points)** Calculate $\frac{d}{ds} \arctan(4s^2)$.
3. **(6 points)** Given that $f(x) = \frac{\operatorname{arcsec} x}{\ln x}$, calculate $f'(x)$.
4. **(2 point bonus)** From the implicit relationship $x^y = y^3$, determine $\frac{dy}{dx}$.