Quiz 7 Solution

October 6, 2017

1. (4 points) Sand is poured onto a surface at 10 ft^3/sec, forming a conical pile whose base diameter is always equal to its altitude. How fast is the altitude of the pile increasing when the pile is 2 ft high?

   (The volume of a cone is $V = \frac{1}{3}\pi r^2 h$ where r is the radius of the base and h is the height of the cone.)

   Solution:

   (1) Since $h = 2r$ (or $r = \frac{1}{2}h$), we can rewrite V as

   $$\begin{aligned} V &= \frac{1}{3}\pi r^2 h \\ &= \frac{1}{3}\pi(\frac{1}{2}h)^2 h \\ &= \frac{1}{12}\pi h^3 \end{aligned}$$

   (2) We know $h = 2$ and $\frac{dV}{dt} = 10$; we want $\frac{dh}{dt}$.

   (3) Taking the derivative of our equation with respect to t, we get

   $$\frac{dV}{dt} = \frac{1}{4}\pi h^2 \frac{dh}{dt}$$

   (4) Substituting, we get

   $$10 = \frac{1}{4}\pi(2^2)\frac{dh}{dt}$$

   (5) Solving for $\frac{dh}{dt}$, we get $\frac{dh}{dt} = \frac{10}{\pi}$.

   Answer: $\frac{10}{\pi}$ ft/sec

2. (1 point) What do you most need to review for Exam 2?
   Answer: Answers will vary.