**Dawson College**: **Calculus 1**: 201-NYA-05-C2: Winter 2008: Thurs. March 27th

**Name:** _____

**Student ID:** _____

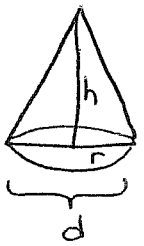
# Quiz 8

This quiz is graded out of 10 marks. No books or notes are allowed. SHOW ALL YOUR WORK. If you need more space for your answer use the back of the page.

**Question 1.** *(10 marks)*

At a sand and gravel plant, sand is falling off a conveyor belt and onto a conical pile at a rate of $3\frac{m^3}{s}$. The diameter of the base of the cone is 2.5 times the altitude of the cone. At what rate is the height of the conical pile changing when the pile is $5m$ high?

(Volume of a cone is $V = \frac{\pi}{3}r^2h$, where $r$ is the radius and $h$ the height of the cone)




Let V = volume
r = radius of cone
d = diameter
h = height

Looking for $\frac{dh}{dt}$ when $h = 5m$

Given $\frac{dV}{dt} = 3 m^3/s$

Relationship between h & r

$d = 2.5h$

but $d = 2r$ so $2r = 2.5h$

$r = \frac{2.5}{2}h \quad \left(r = \frac{5}{4}h\right)$

Equation $V = \frac{\pi}{3}r^2h$

$V = \frac{\pi}{3}\left(\frac{5}{4}h\right)^2 h \Rightarrow V = \frac{25\pi}{48}h^3$

differentiate & substitute givens

$\frac{dV}{dt} = \frac{75\pi}{48}h^2\frac{dh}{dt} \Rightarrow 3 = \frac{75\pi}{48}(5)^2\frac{dh}{dt}$

$\Rightarrow \boxed{\frac{dh}{dt} = 48/625\pi \ m/s}$