Quiz 5

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19 Oct 2012

This test totals 10 points (but weighted the same in the calculation of your grade) and you get 10 minutes to do it. Good luck!

A cone is expanding with time. When the height of the cone is $\sqrt{8}$ m and the radius of the cone is 1, it is found that rate of change of the height is $\sqrt{8}$ m/s and the rate of change of radius is 1 m/s. Find the rate of change of its surface area at this instant. [Hint: The surface area of a cone is given by the formula $\pi\sqrt{r^2 + h^2}r$. Make sure you use the right rule of differentiation and remember both the radius and height are changing!]

\[
\frac{dh}{dt} = \sqrt{8} \text{ m/s} \quad \frac{dr}{dt} = 1 \text{ m/s}
\]

\[
\frac{ds}{dt} = ? \quad \text{when} \quad h = \sqrt{8} \text{ m} \quad r = 1 \text{ m}
\]

\[
s = \pi \sqrt{r^2 + h^2} r^2
\]

\[
\frac{ds}{dt} = \frac{\pi}{2 \sqrt{r^2 + h^2} r^2} \left(4r^2 + 2h^2 \frac{dh}{dt} r^2 + 2r \frac{dr}{dt} h^2\right)
\]

\[
= \frac{\pi}{2 \sqrt{1 + 8} \times 1} \left(4 + 2 \times 8 \times 1 + 2 \times 1 \times 8 \right)
\]

\[
= \frac{3\pi}{2 \times 3} = \frac{6\pi}{6} = 6\pi \text{ m}^2/\text{s}
\]

Ans!