15. $y = \sin(xy)$

$\frac{dy}{dx} = \left(y + x\frac{dy}{dx}\right)\cos(xy)$

$\frac{dy}{dx} = y\cos(xy) + x\cos(xy)\frac{dy}{dx}$

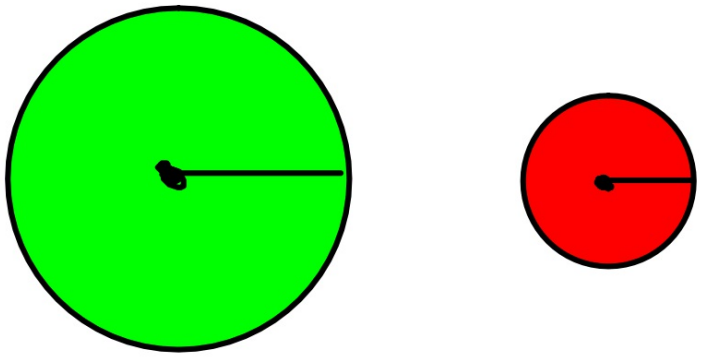
$u = xy \qquad y = \sin u$

$du = y + x\frac{dy}{dx} \qquad dy = \cos u$

$\left(y + x\frac{dy}{dx}\right)\cos(xy)$

2.6A Related Rates

A. Related Rate - a situation where the change in one quantity relates to the change in another



1. Five steps

$V = \frac{4}{3}\pi r^3$

a. Determine what is asked

b. Determine what is given

c. Draw a picture

d. Write an equation

e. Derive and Solve

Ex. $y = x^2 + 3$. Find $\frac{dy}{dt}$ when $x = 1, \frac{dx}{dt} = 2$.

a. $\frac{dy}{dt}$

b. $x = 1, \frac{dx}{dt} = 2$

c. NA

d. $y = x^2 + 3$

e. $\frac{dy}{dt} = 2x \frac{dx}{dt}$

$\frac{dy}{dt} = 2(1)(2) = 4$

Ex. If $\frac{dx}{dt}=1$ when $x=6$, find

$\frac{dy}{dt}$ if $x^2+y^2=100$ | P.154 1-8

a. $\frac{dy}{dt}$

b. $x=6, \frac{dx}{dt}=1$

c. NA

d. $x^2+y^2=100$

e. $2x\frac{dx}{dt}+2y\frac{dy}{dt}=0$

$-2x\frac{dx}{dt}$

$\frac{2y\frac{dy}{dt}}{2y}=\frac{-2x\frac{dx}{dt}}{2y}$

$=\frac{-x\frac{dx}{dt}}{y}$

$=\frac{(-6)(1)}{8}$

$=-3/4$

$x^2+y^2=100$

$(6)^2+y^2=100$

$36+y^2=100$

$y^2=64$

$y=8$