AP Calculus AB

Wednesday, December 19, 2012

$\boxed{\text{Be Prepared p.318 \#6}}$

$A=\pi r^2$

$V=\pi r^2 h$

$\frac{dr}{dt}=3\,m/min$

$A=100\pi\ m^2$

$r=10m$

$V=100000m^3$

(a) $\frac{dA}{dt}=?$

$A=\pi r^2$

$\frac{dA}{dt}=2\pi r\cdot\frac{dr}{dt}$

$\frac{dA}{dt}=2\pi\cdot 10_{m}\cdot 3_{m/min}$

$\frac{dA}{dt}=60\pi\ \frac{m^2}{min}$

(b) $V=\boxed{\pi r^2}h$

$\frac{dV}{dt}=\pi r^2\frac{dh}{dt}+h\cdot 2\pi r\cdot\frac{dr}{dt}$

We know $V=100000m^3 \longrightarrow \frac{dV}{dt}=0\frac{m^3}{min}$

$r=10m$

$\frac{dr}{dt}=3m/min$

$\frac{dh}{dt}=?$

$0=\pi\cdot 10^2\cdot\frac{dh}{dt}+h\cdot 2\pi\cdot 10\cdot 3$

$V=\pi r^2 h$

$100000=\pi\cdot 10^2\cdot h$

$h=\frac{1000}{\pi}m$

$0=\pi\cdot 100\cdot\frac{dh}{dt}+\frac{1000}{\cancel{\pi}}\cdot 2\cancel{\pi}\cdot 30$

$-100\pi\frac{dh}{dt}=60000$

$\frac{dh}{dt}=\frac{600\cancel{00}}{-1\cancel{00}\pi}\ m/min$ OR $-\frac{600}{\pi}\frac{m}{min}$

(c) $\frac{dA}{dh}=?$

$V=\boxed{\pi r^2}h$

$V=Ah$

$\frac{dV}{dt}=A\frac{dh}{dt}+h\cdot\frac{dA}{dt}$

$0=A\frac{dh}{dt}+h\frac{dA}{dt}$

manipulate eqn to find $\frac{dA}{dh}$

$-A\frac{dh}{dt}=h\frac{dA}{dt}$

$\frac{-A\,dh}{dt}=\frac{h\cdot dA}{dt}$

$\frac{-A\,dh}{dh}=\frac{h\,dA}{dh}$

$-A=h\frac{dA}{dh}$

$-\frac{A}{h}=\frac{dA}{dh}$

$\frac{dA}{dh}=\frac{-100\pi}{\frac{1000}{\pi}}\frac{m^2}{m}$

$\frac{dA}{dt}\div\frac{dh}{dt}$

$\frac{dA}{\cancel{dt}}\cdot\frac{\cancel{dt}}{dh}$

$\frac{dA}{dh}=60\pi\div\frac{-600}{\pi}$

$=60\pi\cdot\frac{-\pi}{600}\frac{m^2}{m}$

Math: 8

nDeriv(Y_1, x, x-value)

nDeriv (function, ~~with respect to~~ x variable, value)

$y_1=$

Ex. $y=x^2$

Use calc tography':

$y_1=x^2$

$y_2=nDeriv(Y_1,x,x)$

OR find value of deriv @ $x=-1$:

~~Homescreen~~:

nDeriv(x^2 Y_1, x, −1)

$y'=2x$

$y'@x=-1\to -2$

$f'(x) = \frac{\cos^2 x}{x} - \frac{1}{5}$

$y_1 = (\cos(x))^2 \div x - 0.2$

X: 0 to 10

Y: -1 to 1

(31) $\lim_{x \to \infty} \frac{x^2 - 4}{2 + x - 4x^2} = -\frac{1}{4}$

(22) $\lim_{h \to 0} \frac{\cos\left(\frac{\pi}{2} + h\right) - \cos\frac{\pi}{2}}{h}$

$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$

$f(x) = \cos x$
x-value is $\frac{\pi}{2}$

This question is asking for $f'\left(\frac{\pi}{2}\right)$?

$f'(x) = -\sin x$

$f'\left(\frac{\pi}{2}\right) = -1$

(40) find $\frac{dV}{dt}$ & plug in 40 sec.

$\frac{dV}{dt} = -40 + 0.4t$

$\left.\frac{dV}{dt}\right|_{t=40} = -40 + 0.4(40)$

$= -24 \text{ in}^3/\text{sec}$

A function is continuous @ $x = c$ iff:

1. $f(c)$ exists
2. $\lim_{x \to c} f(x)$ exists — lim from left = lim from right
3. $\lim_{x \to c} f(x) = f(c)$

L'Hopital's Rule

$\lim_{x \to \infty} \frac{f(x)}{g(x)} = \lim_{x \to \infty} \frac{f'(x)}{g'(x)}$

Ex. $\lim_{x \to 0} \frac{\sin x}{x} = \frac{0}{0}$ indeterminate form

use L'Hopital's Rule:

$\lim_{x \to 0} \frac{\cos x}{1} = \frac{1}{1} = 1$