$V = \frac{4}{3}\pi r^3$ $\frac{dv}{dt} = 4\pi r^2 \frac{dr}{dt}$ (4) $\frac{dv}{dt} = 6cm3$

$\frac{dv}{dt} = \frac{4}{3}\pi 3r^2 \frac{dr}{dt}$ $\frac{dv}{dt} = 4\pi(8)^2\left(\frac{3\pi}{128}\right) = 6$ ✓ $\frac{dr}{dt} = \frac{3\pi}{128}$ cm/seg

$r = 8cm$

Prepa Tec
Calculus I 3rd partial
Quiz # 1A

Name Elda Sarahi Del Rio Santillan Mat. A01570233

70

I. Determine if true or false for each of the following statements (10 points each)

1. True The second derivative of $y = 2e^{x^3}$ is $\frac{d^2y}{dx^2} = 6xe^{x^3}(2+3x^3)$

2. False The derivative of $6x - 4x^2y = 2y^2 + 1$ is $\frac{dy}{dx} = \frac{-6}{8x+4y}$ $y' = \frac{8xy-6}{-4x^2y-4y}$

3. False ✗ The derivative of $y = x^{2x}$ is $y' = 2x^{2x}(\ln(x)+1)$ $\to y' = \frac{2x}{x} + 2\ln(x) \cdot (x^{2x})$

4. True ✗ A spherical balloon is being inflated with a gas at a rate of 6 cm³ per second. Then the rate at which its radius is changing when its radius measures 8 cm is $\frac{dr}{dt} = \frac{3\pi}{128}\left[\frac{cm}{sec}\right]$. (Hint: $V = \frac{4}{3}\pi r^3$)

$\frac{dv}{dt} = 6cm^3$ $6 = 4\pi(8)^2\frac{dr}{dt}$ $\frac{6}{4\pi(64)} = \frac{dr}{dt} = \frac{3\pi}{128}$

II. Answer the following problem. (10 points each letter)

A dynamite charge blows a rock up with a velocity of 160 ft/s. The height of the rock is given by the function $h(t) = 160t - 16t^2$ where "h" is measured in feet and "t" in seconds. Find the following:

a) The equation that gives the velocity of the rock at any time.

velocity : $h'(t) = 160 - 32t$

b) The time when velocity is zero (that is the time to reach the maximum height)

$0 = 160 - 32t$ $t = -160/-32$
$-160 = -32t$ $t = 5$

$t = 5$ seconds

c) The maximum height of the rock (that is when velocity is zero)

t=5

$h(5) = 160t - 16t^2$
$h(5) = 160(5) - 16(5)^2 \to 800 - 16(25)$
$800 - 400 = 400$

maximum height : 400 ft

d) The times (on the way up and on the way down) when the height is at 256 feet.

$256 = 160t - 16t^2$
✓ $256 = 160(2) - 16(2)^2$

t = 2 seconds on the way up and on the way down, it's the same to both conditions

times on the way up = 2 seconds
times on the way down = 2 seconds

e) The velocities of the rock when the height is 256 feet.

the same time

velocity = $h'(t) = 160 - 32t$ $h'(2) = 96$
$h'(2) = 160 - 32(2)$
$160 - 64$

velocities when the height is 256 is : $v = 96$ ft/s

f) The equation that gives the acceleration of the rock at any time.

acceleration $h''(t) = -32$

①

$y = 2e^{x^3}$

$u = 2 \quad u' = 0$

$v = e^{x^3} \quad v' = 3x^2 e^{x^3}$

e^{3x^2}

$y' = 6x^2 e^{x^3}$

$u = 6x^2 \quad u' = 12x$

$v = e^{x^3} \quad v = 3x^2 e^{x^3}$

$6x^2(3x^2 e^{x^3}) + 12x e^{x^3}$

$18x^4 e^{x^3} + 12x e^{x^3}$

$y'' = 6xe^{x^3}(2 + 3x^3)$

② $6x - 4x^2 y = 2y^2 + 1$

$6x - 4x^2 y - 2y^2 - 1 = 0$

$6 - (4x^2 y' + 8xy) - 4yy'$

$4x^2 y$

$u = 4x^2 \quad u' = 8x \rightarrow 4x^2 y' + 8xy$

$v = y \quad v' = y'$

$6 - 4x^2 y' - 8xy - 4yy'$

$-4x^2 y' - 4yy' = 8xy - 6$

$y' = (-4x^2 - 4y) = 8xy - 6$

$y' = \dfrac{8xy - 6}{-4x^2 - 4y}$

③ $y = x^{2x}$

$\ln y = \ln(x^{2x}) \quad u = 2x \quad u' = 2$

$\ln y = 2x \ln(x) \quad v = \ln x \quad v' = \frac{1}{x}$

$\frac{y'}{y} = 2x \cdot \frac{1}{x} + 2\ln x$

$\frac{y'}{y} = \frac{2x}{x} + 2\ln x$

$\frac{y'}{y} = 2 + 2\ln x \,(x^{2x})$