*Carryover Student.

MARIA O.I MORPHY-ENEBELI
18/ENG04/051
ELECT/ELECT
MATH 104

1) Eqn $\frac{dy}{dx}$ $y = (2x^2+3)/\ln 2x$

Using Quotient Rule.

$y = u/v$; $\frac{dy}{dx} = \frac{v\,du/dx - u\,dv/dx}{v^2}$

$u = 2x^2+3$, $du/dx = 4x$

$v = \ln 2x$, $dv/dx = \frac{1}{2x} \cdot 2 = 1/x$

$$\frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2} = \frac{\ln 2x \cdot 4x - (2x^2+3) \cdot 1/x}{(\ln 2x)^2}$$

$$dy/dx = \frac{4x\ln 2x - (2x + 5x^{-1})}{(\ln 2x)^2}$$

at $x = 2.5$.

$$= \frac{4(2.5)\ln 2(2.5) - (2(2.5) + 8/2.5)}{[\ln(2(2.5))]^2}$$

$$= \frac{10 \cdot \ln 5 - (5 + 1.2)}{(\ln 5)^2}$$

$$= \frac{16.094 - 6.2}{2.590}$$

$$= \frac{7.894}{2.590}$$

$$\left.\frac{dy}{dx}\right|_{x=2.5} = 3.82$$

2. Soln

Gradient $= df/dx$

$f = \frac{2x}{x^2-5}$

Pg 2

$\frac{df}{dx} = \frac{(x^2-5)2 - 2x.(2x)}{(x^2-5)^2}$

$= \frac{2(x^2-5) - 4x^2}{x^2-5}$

at $x = -4$

$\frac{df}{dx} = \frac{2((-4)^2-5) - 4(-4)^2}{(-4)^2-5}$

$= \frac{2(16-5)-16}{16-5}$

$= \frac{22-16}{11} = 6/11 = 0.545$

$\simeq 0.55$

at $y = 2$

$y = \frac{2x}{x^2-5}$

$2 = \frac{2x}{x^2-5}$

$2(x^2-5) = 2x$

$2x^2 - 10 = 2x$

$2x^2 = 2x + 10$

$x^2 = x + 5$

$x^2 - x + 5 = 0$

Quadratic equation

$a = 1, b = -1, c = 5$

$x = \frac{-b \pm \sqrt{b^2 - 4a}}{2a}$

$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(5)}}{2(1)}$$

$$= \frac{1 \pm \sqrt{1-20}}{2} = \frac{1 \pm \sqrt{-19}}{2}$$

Pg 2 cont'd.

$$x_1 = \frac{1 + \sqrt{-19}}{2} \; ; \; x_2 = \frac{1 - \sqrt{-19}}{2}$$

$$x_1 = \frac{1}{2} + i\frac{\sqrt{19}}{2} \; ; \; x_2 = \frac{1}{2} - i\frac{\sqrt{19}}{2}$$

$$x_1 = 0.5 + i\frac{4.36}{2} \; ; \; x_2 = \frac{1}{2} - i\frac{4.36}{2}$$

$$x_1 = 0.5 + i\,2.18 \; ; \; x_2 = 0.5 - i\,2.18$$

3. $z = 2x^3 \ln y$

$$\frac{dz}{dy} = 2x^3 \cdot \frac{d(\ln y)}{dy} + \ln y \cdot \left(\frac{d\,2x^3}{dy}\right)$$

$$= 2x^3 \cdot \left(\frac{1}{y}\right) + \ln y \cdot 6x^2 \cdot \frac{dx}{dy}$$

$$\frac{dz}{dy} = \frac{2x^3}{y} + 6x^2 \frac{dx}{dy} \ln y$$

Pg 3

4. Solv

$$\int_0^2 x(2x^2+1)^{1/2}\,dx$$

Let $u = 2x^2+1$ P.94.

$\frac{du}{dx} = 4x$

$dx = \frac{du}{4x}$

$$\int_0^2 x\,u^{1/2}\cdot\frac{du}{4x} = \frac{1}{4}\int_0^2 u^{1/2}du$$

$$= \frac{1}{4}\int_0^2 u^{1/2}du = \frac{1}{4}\left[\frac{u^{1/2+1}}{1/2+1}\right]_0^2$$

$$= \frac{1}{4}\left[\frac{u^{3/2}}{3/2}\right]_0^2 = \frac{1}{4}\left[(2x^2+1)^{3/2}\right]_0^2$$

$$= \frac{1}{4}\left[(2.2^2+1)^{3/2} - (2(0)+1)^{3/2}\right]$$

$$= \frac{1}{4}\left[7^{3/2} - 1\right]$$

$$= \frac{1}{4}\left[\sqrt{9}^3 - 1\right]$$

$$= \left[27 - 1\right]$$

$$= \frac{1}{4}(26) = \frac{26}{4}$$

$$= 6.5/4.$$