3√28 3√27

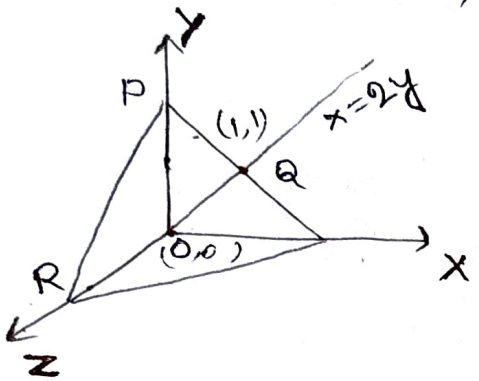
a = 27 b = 28

$P(28) = P(27) + (28-27) P'(27+\theta)$

T.C = 2 Dr. Debasis Ghosh 27.12.21

R-1: find the volume of tetrahedron bounded by planes

$x=0,\ z=0,\ x=2y \qquad x+2y+z=2$



$z = 2-x-2y$

$y = x/2$

$x+2y = 2$

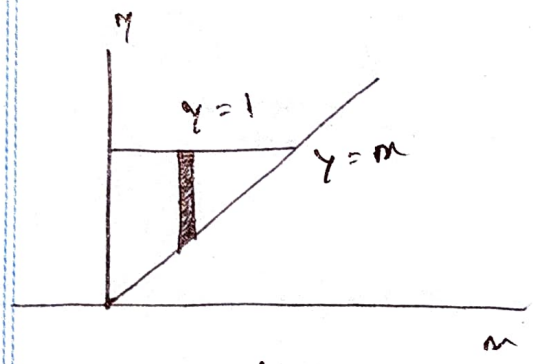
$y = 1 - x/2$

$x/2 = 1 - x/2$

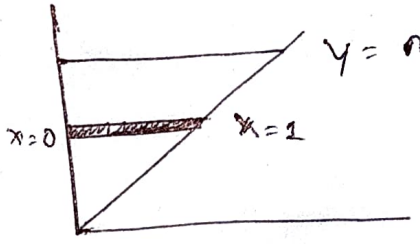
$\Rightarrow x = 1$ point of intersection

$$\int_0^1 \int_{x/2}^{1-x/2} z \, dy\, dx$$

Pr-2 calculate the iterated integral $\int_0^1 \int_x^1 \sin y^2 \, dy\, dx$



change of order



$$\int_{y=0}^{y=1} \int_{x=0}^{x=y} \sin y^2 \, dx\, dy = \left[\tfrac{1}{2}(1-\cos 1)\right]$$

Single Variable calculus

$f : [a, b] \to R$

f is conti $[a, b]$

$f'(x)$ exist (a, b)

$\exists : f'(c) = \dfrac{f(b) - f(a)}{b - a}$

$\dfrac{df}{dx}$. to $\dfrac{\Delta f}{\Delta x}$

Roll's Theorem :- $f(a) = f(b)$ Particular case of L.M.V.T

$f'(c) = 0$

Cauchy's M.V.T : $f, g : [a,b]$; f and g are continuous $[a,b]$ and f' and g' exists (a,b)

$g(a) \neq g(b)$ and $g'(x) \neq 0 \ \forall \ x \in (a,b)$

$$\frac{f'(c)}{g'(c)} = \frac{f(b) - f(a)}{g(b) - g(a)} \qquad a < c < b$$

$g(x) = x$

$$\frac{f(b) - f(a)}{b - a} = \frac{f'(c)}{1} \rightarrow \text{L.M.V.T}$$

L'Hospital Rule:

$f, g : [a,b]$

f, g differentiable at $x_0 \in (a,b)$

* $f(x_0) = g(x_0) = 0$

$g'(x_0) \neq 0$

$$\frac{f(x) - f(x_0)}{g(x) - g(x_0)} = \frac{f'(x_0)}{g'(x_0)} \qquad a < x_0 < x < b$$

$$\Rightarrow \lim_{x \to x_0} \frac{f(x)}{g(x)} = \frac{f'(x_0)}{g'(x_0)}$$

Ex:

$f(x) = 3x^2 - 5x \qquad g(x) = 2x - 3$

polynomial ⟶ continuous

$f'(x) = 6x - 5 \qquad g'(x) = 2 \neq 0 \ \forall x$

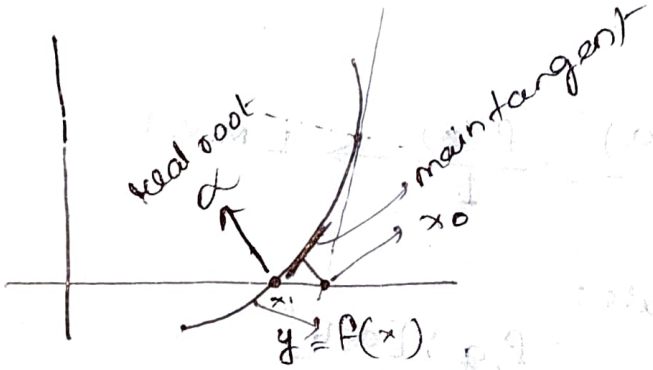
$$\lim_{x \to 0} \frac{f(x)}{g(x)} = 0 \neq -5/2 = \frac{f'(0)}{g'(0)}$$

$f'(0) = 0 - 5, \quad g'(0) = 2 \qquad \frac{f'(0)}{g'(0)} = -5/2$

* $f(x_0 = 0) = 0 \;/\; g(x_0 = 0) = 3 \neq 0$

→ necessary

Newton iterated method:-



L.M.V. Th $f: [a, a+h]$

$$f'(a + \theta h) = \frac{f(a+h) - f(a)}{h}$$

$[x_0, x_1]$. $\quad f(x_1) = f(x_0) + (x_1 - x_0) f'(x_0)$

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$$

Pr ① :- Find the mean value of a, m, b for the function

$$f(x) = \begin{cases} 3, & x = 0 \\ -x^2 + 3x + a, & 0 \le x < 1 \\ mx + b & 1 \le x \le 2 \end{cases}$$

$a = 3$

Satisfy L.M.V.Th on $[0, 2]$

② Test the f^2 $y = x^2$ increasing / decreasing $\forall x$