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SUBJECT: MATHEMATICS  
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DEPARTMENT: MICROBIOLOGY  
MID-SUMMER EXAM

Q.1) Find the integration of the following: -

a)  $\int (x^2 e^x) dx$

**SOLUTION:**

$\int (x^2 e^x) dx$   
Integration by parts:

$$\begin{aligned} \int (x^2 e^x) dx &= x^2 e^x - \int 2x e^x dx \\ &= x^2 e^x - 2 \int x e^x dx \end{aligned}$$

$\Rightarrow$  Integration again by parts,

$$\begin{aligned} &= x^2 e^x - 2 [x e^x - \int 1 \cdot e^x dx] \\ &= x^2 e^x - 2 [x e^x - e^x] + c \end{aligned}$$

$$= x^2 e^x - 2x e^x + e^x + c$$

b)  $\int (5x^2 + x^{-2} + 15) dx$

**SOLUTION:**

$$\int (5x^2 + x^{-2} + 15) dx$$

$$= \int (5x^2 + x^{-2} + 15) dx = \frac{5x^3}{3} + \frac{x^{-1}}{(-1)} + 15x$$

$$= \int (5x^2 + x^{-2} + 15) dx = \frac{5x^3}{3} - \frac{1}{x} + 15x$$

c)  $\int (x^3 + x^{-2} + 5) dx$

**SOLUTION:**

$$\int (x^3 + x^{-2} + 5) dx$$

$$\int (x^3 + x^{-2} + 5) dx = \frac{x^4}{4} + \frac{x^{-1}}{(-1)} + 5x$$

$$\int (x^3 + x^{-2} + 5) dx = \frac{x^4}{4} - \frac{1}{x} + 5x$$

Q2: Find the solution of the following:-

a) If 56% of the homes in a colony have a car. What percentage of homes does not have a car?

• **SOLUTION:**

• **GIVEN DATA:**

The percentage of colony cars = 56%

• **REQUIRED:**

The number of houses which does not have cars = ?

**SOLUTION:-**

⇒ Suppose there are total number of houses in the colony = 100  
⇒ The number of houses which doesn't have car =  $100 - 56 = 44$

Hence, the percentage of houses with no cars =  $\frac{44}{100} \times 100 = 44\%$

b) There are 1029 students in a school. 504 of them are girls. Find the ratio of boys to the girls.

### GIVEN DATA:

Students in school = 1029  
Strength of girls = 504

### REQUIRED:

Ratio of boys to girls = ?

### SOLUTION:

total = 1029  
Given = 504

$$\text{So, } 1029 - 504 = 525.$$

Number of boys = 525

$$\frac{504}{1029} \times 100 = 48.98$$

Boys = (51.2)

Approximately

$$\boxed{51 \sim 49}$$

$$\text{Exact Ratio} = \boxed{51.2 : 48.98} \text{ Ans}$$

c) Amna scored 46 out of 50 in a math test, 64 out of 75 in a chemistry test and 72 out of 80 in physics test. In which subject did she performed best?

### GIVEN DATA:

$$\text{Maths} = \frac{46}{50} \times 100 = 92\%$$

$$\text{Chemistry} = \frac{64}{75} \times 100 = 85.33\%$$

$$\text{Physics} = \frac{72}{80} \times 100 = 90\%$$

### PROVED:

From the above percentages it is clear that she performed well in maths as she got a high percentage.

which is 92% in maths.

Q.3) Find the derivatives of the following:-

a)  $S = -4t^5 + 4/t + 5t + 1/4$ .

**\* SOLUTION:**

$$S = -4t^5 + 4/t + 5t + 1/4$$

$$\frac{ds}{dt} = \frac{d}{dt} (-4t^5 + 4t^{-1} + 5t + 1/4)$$

$$\frac{ds}{dt} = 20t^{-6} - 4t^{-2} + 5$$

b)  $Y = x^5 + 3x^3 - x^2 + 4$

**\* SOLUTION:**

$$dY = x^5 + 3x^3 - x^2 + 4$$

$$\frac{dy}{dx} = \frac{d}{dx} (x^5 + 3x^3 - x^2 + 4)$$

$$\frac{dy}{dx} = 5x^4 + 9x^2 - 2x$$

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c)  $T = 6x^{-3} + x^3 + 5x - 2$

**SOLUTION:**

$$T = 6x^{-3} + x^3 - 5x - 2$$

$$\frac{dT}{dx} = \frac{d}{dx} (6x^{-3} + x^3 + 5x - 2)$$

$$\frac{dT}{dx} = -18x^{-4} + 3x^2 + 5$$

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