Victoria University of Bangladesh

Course Title	:	Differential Calculus and Coordinate Geometry
Course Code	:	MAT 115
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Submit Date	:	15/12/2022
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Program	:	CSIT (Day)

Stay At Home & Stay Safe

Answer to the question number : 01

$$\lim_{x \to 0} \frac{\sqrt{1+x}-1}{x}$$

By using Relationalization,

$$\lim_{x \to 0} \frac{\sqrt{1+x}-1}{x} \times \frac{\sqrt{1+x}+1}{\sqrt{1+x}+1}$$

$$\lim_{x \to 0} \frac{(1-x)-1}{x(\sqrt{1+x}+1)}$$

$$= \lim_{x \to 0} \frac{x}{x(\sqrt{1+x}+1}$$

$$= \frac{1}{\sqrt{1}+1}$$

$$= \frac{1}{2}$$

Ans: $\frac{1}{2}$

Answer to the question number: 2

(1) $f(x) = x^3 + 5x^2$

We have to find.

1) $f(1)$, 2) $F(-2)$ and 3) $F(-\frac{1}{2})$

(1) $F(1)$

$F(x) = x^3 + 5x^3$

Putting value of $x = 1$ in the function

$$F(1) = (1)^3 + \cancel{5x}\, 5(1)^2$$
$$= 1 + 5$$
$$= 6$$

(2) $F(-2)$

$F(x) = x^3 + 5x^2$

Putting the value of $(x) = 2$ in the function

$$F(-2) = (-2)^3 + 5(-2)^2$$
$$= -8 + 20$$
$$= 12$$

③ $F(-\frac{1}{2})$

$F(x) = x^3 + 5x^2$

Putting the value of $x = -\frac{1}{2}$ in the function

$$F(-\tfrac{1}{2}) = (-\tfrac{1}{2})^3 + 5(-\tfrac{1}{2})^2$$
$$= 11/8$$

So, The value of $F(1)$, $F(-2)$ and $F(-\frac{1}{2})$ are $6, 12, 11/8$

Answer to the question number : 03

$$\int (2e^x + \frac{6}{x} + \ln 2)\, dx$$
$$= 2\int e^x\, dx + 6\int \frac{1}{x}\cdot dx + \ln 2 \int dx$$
$$= 2e^x + 6\ln|x| + (\ln 2)x + c$$ Ans:

Answer to the question number: 4

$f(x)\ x^2 \cdot \sin x$

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

$$= \lim_{h \to 0} \frac{(x+h)^2 \cdot \sin(x+h) - x^2 \cdot \sin x}{h}$$

$$= \lim_{h \to 0} \frac{(x^2 + h^2 + 2xh)\sin(x+h) - x^2 \sin x}{h}$$

$$= \lim_{h - 0} \frac{x^2 \sin(x+h) - x^2 \cdot \sin x}{h} + \lim_{h \to 0} \frac{h(h+2x)\sin(x+h)}{h}$$

$$= x^2 \lim_{h \to 0} \frac{2 \sin\left(\frac{x+h-x}{2}\right) \times \cos \frac{x+h+x}{2}}{h} + 2x \sin x$$

$$= x^2 \lim_{h \to 0} \frac{\sin(h/2)}{h/2} \times \cos \frac{(2x+h)}{2} + 2x \sin x$$

$$= x^2 \cdot 1 \cdot \cos x + 2x \sin x$$

$\therefore\ x^2 \cos x + 2x \sin x$ (Ans:)

Answer to the question numbers 05

In Calculas, the chain rules is a formula that express the derivative of the composition of two differentiable functions f and g in terms of the derivaties of f and g. None precisely if $(h) = f \circ g$ is the function that $h(x) = f(g(x))$. For every x, then the rule is in langugue is notation,

$$h'(x) = f'(g(x))g'(x)$$

or equivalently,

$$h' = (f \circ g)' = (f' \circ g) \cdot g'$$

The chain rule may also be express in Leibns notation. If ~~ava~~ a valuable z depends on the variale y, which itself depends on x as well, via intermediate variable y. In this cas, the chain rule is expressed as

$$\frac{dz}{dx} = \frac{dz}{dy} \cdot \frac{dy}{dx},$$

and

$$\left.\frac{dz}{dx}\right|_{x} = \left.\frac{dz}{dy}\right|_{y(x)} \cdot \left.\frac{dy}{dx}\right|_{x}.$$

For indicting at which points the derivative have to be evaluate.

In integratio, the counterpart to the chain rule is the substitution rule.