SECTION 16.1

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* Section 16.1:-

* Question # 3:-

$f(x) = x^2 - 3x + 20$ — eq①.

ⓐ $f'(x) = 2x - 3$ — eq②.

Put $x = 1$ in eq②.

$f'(x) = 2x - 3$.

$f'(1) = 2(1) - 3$.

$\Rightarrow \boxed{-1 < 0}$

Therefore, the above function states that f is decreasing at $x = 1$.

ⓑ $f'(x) > 2x - 3$.

$2x - 3 > 0$

$2x > 3$

$\boxed{x > 3/2.}$

ⓒ $f'(x) \cancel{=} 2x - 3$

$2x - 3 < 0$.

$2x < 3$

$\boxed{x < 3/2.}$

ⓓ $f'(x) = 2x - 3$.

$2x - 3 = 0$

$2x = 3$

$\boxed{x = 3/2}$

* Question # 5:-

$$f(x) = \frac{x^3}{3} + \frac{x^2}{2}.$$

$$f'(x) = \frac{\cancel{3}x^2}{\cancel{3}} + \frac{\cancel{2}x}{\cancel{2}}$$

$$f'(x) = x^2 + x$$

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ⓐ Put $x = 1$ in eq ②.

$f'(x) = x^2 + x$

$= (1)^2 + (1)$

$\Rightarrow \boxed{2 > 0}$

The above function states that f is increasing at $x = 1$.

ⓑ $f'(x) = x^2 + x$.

$x^2 + x > 0$

$x(x+1) > 0$.

$x > 0$ OR $x + 1 > 0$

$\Rightarrow$ $x > 0$. OR $x > -1$

ⓒ $f'(x) = x^2 + x$.

$x^2 + x < 0$.

$x(x+1) < 0$

$\Rightarrow$ $x < 0$ OR $x < -1$

ⓓ $f'(x) = x^2 + x$

$x^2 + x = 0$.

$x(x+1) = 0$

$\Rightarrow$ $x = 0$ OR $x = -1$.

* Question # 9:-

$f(x) = (x+3)^{3/2}$ — eq ①.

$f'(x) = \frac{3}{2}(x+3)^{1/2} \frac{d}{dx}(x+3)$

$f'(x) = \frac{3}{2}(x+3)^{1/2}(1)$

$f'(x) = \frac{3(x+3)^{1/2}}{2}$ — eq ②.

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(a) Put $x = 1$ in eq (1).

$$f'(x) = \frac{3(x+3)^{1/2}}{2}$$

$$f'(1) = \frac{3(1+3)^{1/2}}{2}$$

$$\Rightarrow \boxed{3 > 0}$$

f is increasing at $x = 1$.

(b) $$f'(x) = \frac{3(x+3)^{1/2}}{2}$$

$$\frac{3(x+3)^{1/2}}{2} > 0.$$

$$3(x+3)^{1/2} > 0.$$

$$(x+3)^{1/2} > 0.$$

$$\sqrt{x+3} > 0.$$

Squaring on both sides

$$(\sqrt{x+3})^2 > (0)^2$$

$$x + 3 > 0.$$

$$\boxed{x > -3.}$$

(c). $$\frac{3(x+3)^{1/2}}{2} < 0.$$

$$3(x+3)^{1/2} < 0.$$

$$(x+3)^{1/2} < 0.$$

$$\sqrt{x+3} < 0.$$

$$x + 3 < 0.$$

$$\boxed{x < -3.}$$

(d) $$\frac{3(x+3)^{1/2}}{2} = 0.$$

$$3(x+3)^{1/2} = 0.$$

$$(x+3)^{1/2} = 0.$$

$$\sqrt{x+3} = 0.$$

$$x + 3 = 0.$$

$$\boxed{x = -3}$$

* Question # 10:-

$$f(x) = \frac{3x^2}{(x^2-1)}$$

$$f'(x) = \frac{(x^2-1)(6x) - (3x^2)(2x)}{(x^2-1)^2}$$

$$f'(x) = \frac{\cancel{6x^3} - 6x - \cancel{6x^3}}{(x^2-1)^2}$$

$$f'(x) = \frac{-6x}{(x^2-1)^2} \quad \text{— eq (2).}$$

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ⓐ Put $x = 1$ in eq ②.

$$\frac{-6(1)}{(1^2-1)^2}$$

$\rightarrow \boxed{\infty}$

Therefore, the above function is neither increasing nor decreasing at $x = 1$.
Infact, the above function is undefined at $x = 1$.

ⓑ $$\frac{-6x}{(x^2-1)^2} > 0.$$

$-6x > 0.$

$\boxed{x > 0}$

x values or domain of above function is $x \in (0,1) \cup (1, \infty)$

ⓒ $$\frac{-6x}{(x^2-1)^2} < 0.$$

$-6x < 0.$

$\boxed{x < 0}$

$x \in (-\infty, 0)$.

ⓓ $$\frac{-6x}{(x^2-1)^2} = 0.$$

$-6x = 0$

$\boxed{x = 0}$

Neither increasing nor decreasing.

* Question # 13:-

$f(x) = 5x^2 + 40x + 50.$

ⓐ $f'(x) = 10x + 40.$

ⓐ Put $x = 1$ in eq ②.

$10(1) + 40.$

$\Rightarrow \boxed{50 > 0}$

function is increasing.

ⓑ. $f'(x) = 10x + 40.$

$10x + 40 > 0.$

$10x > -40.$

$\boxed{x > -4}$

ⓒ

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(c) $f'(x) = 10x + 40$.

$10x + 40 < 0$.

$10x < -40$

$\boxed{x < -4}$

(d) $f'(x) = 10x + 40$.

$10x + 40 = 0$.

$10x = -40$

$\boxed{x = -4}$

* Question # 22:-

$f(x) = x^3 + 12x + 1$.

$f'(x) = 3x^2 + 12$.

$f''(x) = 6x$.

Put $x = -2$ in eq ③.

$f''(-2) = 6(-2)$

$\Rightarrow \boxed{-12 < 0}$ Concave down.

Put $x = 1$ in eq ③.

$f''(1) = 6(1)$

$\Rightarrow \boxed{6 > 0}$ Concave up.

* Question # 25:-

$f(x) = \sqrt{x^2 + 10}$

$f'(x) = \frac{1}{2}(x^2 + 10)^{1/2 - 1} \frac{d}{dx}(x^2 + 10)$.

$f'(x) = \frac{1}{\cancel{2}\sqrt{x^2 + 10}}(\cancel{2}x)$

$f'(x) = \frac{x}{\sqrt{x^2 + 10}}$ —— eq ②.

$f''(x) = \frac{10}{(x^2 + 10)^{1.5}}$ —— eq ③.

Put $x = -2$ in eq ③.

$f''(-2) = \frac{10}{[(-2)^2 + 10]^{1.5}}$ $\Rightarrow \boxed{0.19 > 0}$ Concave up.

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Put $x = 1$ in eq ③.

$$\frac{10}{(1^2 + 10)^{1.5}}$$

$\Rightarrow \boxed{0.27 > 0}$ Concave up.

* Question # 39:-

$f(x) = e^x$

$f'(x) = e^x$

$f''(x) = e^x$

Put $x = -2$ in eq ③.

e^{-2}

$\Rightarrow \boxed{0.135 > 0}$ Concave up.

Put $x = 1$ in eq ③.

e^1

$\Rightarrow \boxed{2.72 > 0}$ Concave up.

* Question # 41:

$f(x) = \ln x$

$f'(x) = \frac{1}{x}$ ~~to~~.

$f'(x) = x^{-1}$

$f''(x) = -x^{-1-1}$

$= -x^{-2}$

$f''(x) = \frac{-1}{x^2}$

Put $x = -2$ in eq ③.

$f''(-2) = \frac{-1}{(-2)^2}$

$\Rightarrow \boxed{-1/4 < 0}$

Concave down.

Put $x = 1$ in eq ③.

$f''(1) = \frac{-1}{(1)^2}$

$\rightarrow \boxed{-1 < 0}$

Concave down.

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* Question # 57:

$f(x) = x^3 + 6x^2 - 18.$

$f'(x) = 3x^2 + 12x.$

$f''(x) = 6x + 12.$

Set $f''(x) = 0.$

$0 = 6x + 12.$

$6x = -12.$

$\boxed{x = -2}$. Possible candidate for x coordinates of inflection point.

For $x = -2$, we input left or right close values of -2 in 2nd derivation.

$f''(-1.9) = 6(-1.9) + 12.$

$\Rightarrow \boxed{0.6 > 0}$

and

$f''(-2.1) = 6(-2.1) + 12.$

$\Rightarrow \boxed{-0.6 < 0}$.

This is confirmed that as 2nd derivative values are opposite, therefore, an inflection point exists at $x = -2$.

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* Question # 63:-

$(3x-12)^{5/2}$

$f'(x) = \frac{5}{2}(3x-12)^{3/2} \frac{d}{dx}(3x-12).$

$f'(x) = \frac{5}{2}(3x-12)^{3/2}(3)$

$f'(x) = \frac{15}{2}(3x-12)^{3/2}$

$f''(x) = \frac{15}{2}\left[\frac{3}{2}(3x-12)^{1/2} \frac{d}{dx}(3x-12)\right]$

$f''(x) = \frac{15}{2}\left[\frac{3}{2}(3x-12)^{1/2}(3)\right]$

$f''(x) = \frac{135}{4}\left(\sqrt{3x-12}\right)$

Put $f''(x) = 0$.

$\frac{135}{4}\left(\sqrt{3x-12}\right) = 0.$

$\sqrt{3x-12} = 0.$

Squaring both sides.

$(\sqrt{3x-12})^2 = (0)^2$

$3x-12 = 0$

$3x = 12$

$\boxed{x = 4}$

For $x = 4$;

$f''(3.9) = \frac{135}{4}\left(\sqrt{3(3.9)-12}\right)$

$\rightarrow$ No inflection point. Close value of $x = 4$ is 3.9 at which the function is undefined.

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* Question # 67:-

$f(x) = e^x$.

$f'(x) = e^x$

$f''(x) = e^x$

$\Rightarrow$ $\boxed{\text{No Inflection Points.}}$

* Question # 69:-

$f(x) = \ln x$.

$f'(x) = x^{-1}$

$f''(x) = -x^{-2}$

$\Rightarrow$ $\boxed{\text{No Inflection Points.}}$

SECTION 16.2

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Section # 16.2 :-

* Question # 5 :-

$$f(x) = \frac{x^3}{3} - 2.5x^2 + 4x.$$

$$f'(x) = \frac{\cancel{3}x^2}{\cancel{3}} - 5x + 4.$$

$$f'(x) = x^2 - 5x + 4.$$

Set $f'(x) = 0$.

$$x^2 - 5x + 4 = 0.$$

~~$x^2 - 5x + 4 = 0$~~

$$x^2 - 4x - x + 4 = 0.$$

$$x(x-4) - 1(x-4) = 0.$$

$$(x-1)(x-4) = 0.$$

$\boxed{x = 1}$ OR $\boxed{x = 4}$.

Now, we put $x = 1$ in eq ①.

$$f(1) = \frac{(1)^3}{3} - 2.5(1)^2 + 4(1).$$

$\Rightarrow \boxed{1.83}$ 1st possible CP lies on $(1, 1.83)$

Similarly, we put $x = 4$ in eq ①.

$$f(4) = \frac{(4)^3}{3} - 2.5(4)^2 + 4(4)$$

$\Rightarrow \boxed{-2.67}$ 2nd possible CP lies on $(4, -2.67)$.

To find out nature, we take $f''(x)$.

$$f''(x) = 2x - 5$$

For $x = 1$:

$$f''(1) = 2(1) - 5$$

$\Rightarrow \boxed{-3 \text{, Relative Maxima}}$

For $x = 4$

$$f''(4) = 2(4) - 5$$

$\Rightarrow \boxed{3 \text{, Relative Minima.}}$

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* **Question # 9:-**

$f(x) = -5x^5 - 10$

$f'(x) = -25x^4$

Set $f'(x) = 0$.

$-25x^4 = 0$.

$\boxed{x = 0}$

Put $x=0$ in eq ①.

$f(0) = -5(0)^5 - 10$.

$\Rightarrow \boxed{-10.}$

$\Rightarrow$ $\boxed{\text{CP lies on } (0, -10)}$ Inflection point.

$f''(x) = -100x^3$

For $x = 0$.

$-100(0)^3$

$\Rightarrow$ No nature can be determined.

* **Question # 29:-**

$f(x) = (x+10)^4$

$f'(x) = 4(x+10)^3 \, (1)$

$f'(x) = 4(x+10)^3$

Set $f'(x) = 0$.

$4(x+10)^3 = 0$.

$(x+10)^3 = 0$.

Taking cube root

$x + 10 = 0$

$\boxed{x = -10}$

Put $x = -10$ in eq ①.

$(-10+10)^4$

$\Rightarrow \boxed{0.}$ $\boxed{\text{CP lies on } (-10, 0) \text{ Relative Minima}}$

Nature;

~~$f''(x) = 12(x+10)^2$~~

~~For $x = -10$.~~

~~$12(-10+10)^2$~~

~~$\Rightarrow 0.$~~

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* Question # 38:-

$$f(x) = -45e^{-0.2x} - 18x + 10.$$

$$f'(x) = 9e^{-0.2x} - 18$$

Set $f'(x) = 0$.

$9e^{-0.2x} - 18 = 0$.

$9(e^{-0.2x} - 2) = 0$.

$e^{-0.2x} - 2 = 0$.

$e^{-0.2x} = 2$.

$\ln(e^{-0.2x}) = \ln(2)$.

$-0.2x = 0.693$.

$\boxed{x = -3.466}$

Now we put $x = -3.466$ in eq ①.

$f(-3.466) = -45e^{-0.2(-3.466)} - 18(-3.466) + 10.$

$= \boxed{-17.617}$ 1st CP is $(-3.466, -17.617)$

Now, we take $f''(x)$ to find nature

$f''(x) = -1.8e^{-0.2x}$

For $x = -3.466$.

$f''(-3.466) = -1.8e^{-0.2(-3.466)}$

$\Rightarrow \boxed{-3.6 < 0}$ Absolute Maxima.

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* Question # 41:-

$f(x) = xe^{-x}$

$f'(x) = e^{-x} - xe^{-x}$

Set $f'(x) = 0$.

$e^{-x} - xe^{-x} = 0$.

$e^{-x}(1-x) = 0$.

$e^{-x} = 0$ OR $1 - x = 0$.

$\ln(e^{-x}) = \ln 0$ OR $x = 1$

$x =$ undefined OR $\boxed{x = 1} \rightarrow$ Possible CP.

$f''(x) = -e^{-x} - [e^{-x} - xe^{-x}]$

$= -e^{-x} - e^{-x} + xe^{-x}$

$f''(x) = -2e^{-x} + xe^{-x}$

For $x = 1$

$f''(1) = -2e^{-1} + 1e^{-1}$

$\Rightarrow \boxed{-0.37 < 0}$

Absolute Maximum.

* Question # 47:

$f(x) = \ln(x^2+1) - x$.

$f'(x) = \dfrac{2x}{x^2+1} - 1$.

$\dfrac{2x}{x^2+1} - 1 = 0$.

$\dfrac{2x}{x^2+1} = 1$

$2x = x^2 + 1$

$0 = x^2 - 2x + 1$

$x^2 - x - x + 1 = 0$.

$x(x-1) - 1(x-1) = 0$.

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$(x-1)(x-1)=0$

$x=1$ OR $x=1$

$\boxed{x=1}$

Put $x=1$ in eq ①.

$\ln(1^2+1)-1$

$\Rightarrow \boxed{-0.31}$ 1st CP lies on $(1, -0.31)$.

$$f''(x) = \frac{2(-x^2+1)}{(x^2+1)^2}$$

$$f''(x) = \frac{-2x^2+2}{(x^2+1)^2}$$

$\Rightarrow 0$.

$\boxed{\text{Inflection Point.}}$

* **Question # 49:-**

$f(x) = 4x\ln x$.

$$f'(x) = 4\left(\frac{d}{dx}\ln x + \frac{d}{dx}(\ln x)(x)\right)$$

$4\left(1 \cdot \ln(x) + \frac{1}{x}x\right)$

$f'(x) = 4(\ln x + 1)$

$4(\ln x + 1) = 0$.

$\ln x + 1 = 0$.

$\ln x = -1$

$e^{\ln x} = e^{-1}$

$\boxed{x = 0.368}$

$f(0.368) = 4(0.368)\ln(0.368)$

$\Rightarrow \boxed{-1.47}$ 1st CP lies on $(0.368, -1.47)$

$$f''(x) = \frac{4}{x}.$$

For $x = 0.368$.

~~For 0.368~~ $f''(0.368) = \dfrac{4}{0.368}$ $\Rightarrow \boxed{10.86}$ Relative Minima

>0.

SECTION 17.1

Question # 53:-

$f(x) = x^2 + x - \ln x.$

$f'(x) = 2x + 1 - \frac{1}{x}.$

Set $f'(x) = 0.$

$2x + 1 - \frac{1}{x} = 0.$

$\frac{2x^2 + x - 1}{x} = 0.$

$2x^2 + x - 1 = 0.$

$2x^2 + 2x - x - 1 = 0.$

$2x(x+1) - 1(x+1) = 0$

$(2x-1)(x+1) = 0$

$\boxed{x = 1/2}$ OR $\boxed{x = -1}$

Put $x = 1/2$ in eq ①.

$f(1/2) = (1/2)^2 + (1/2) - \ln(1/2)$

$= \boxed{1.44}$ 1st CP is $(1/2, 1.44)$ ✓

Similarly put $x = -1$ in eq ①.

$f(-1) = (-1)^2 + (-1) - \ln(-1)$

$\rightarrow$ Inflection Point

Nature,

$f''(x) = 1/x^2 + 2.$

For $x = 1/2$

$f''(1/2) = 1/0.5^2 + 2$

$\Rightarrow 6 > 0$ Relative Minima.

SECTION 17.1

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* Section 17.1:-

* Question # 1:

$R = f(p) = -10p^2 + 1750p$

$f'(p) = -20p + 1750$

ⓐ: $-20p + 1750 = 0$

$-20p = -1750$

$\boxed{p = 87.5}$

ⓑ: $-10(87.5)^2 + 1750(87.5)$

$\Rightarrow \boxed{76562.5}$

* Question # 3:-

$P = -0.01x^2 + 5000x - 25000$

ⓐ $P' = -0.02x + 5000$

$-0.02x + 5000 = 0$

$\boxed{x = 250{,}000}$

ⓑ. $P = -0.01(250{,}000)^2 + 5000(250{,}000) - 25000$

$\Rightarrow \boxed{624975000}$

* Question # 6:-

$C = \frac{51200}{q} + 80q + 750{,}000$

$C' = f'(q) = 51200q^{-1} + 80q + 750{,}000$

$= -51200q^{-2} + 80$

$C' = f'(q) = \frac{-51200}{q^2} + 80$

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(a) $-\frac{51200}{q^2} + 80 = 0.$

$80 = \frac{51200}{q^2}$

$q^2 = 640.$

$q = \pm 25$

$\boxed{q = 25}$

$C'' = f''(q) = +102400\, q^{-3}$

$f''(q) = \frac{102400}{q^3}$

Put $q = 25.$

$f''(25) = \frac{102400}{(25)^3}$

$\Rightarrow \boxed{6.5536 > 0}$

It is confirmed that $q = 25$ is the minimum order size.

(b) $\bar{C} = ?$

put $q = 25$ in eq (1).

$\bar{C} = \frac{51200}{25} + 80(25) + 750{,}000.$

$\Rightarrow \boxed{\bar{C} = \$ 754048.}$

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* Question # 10:-

$$C = 5000\,000 + 250q + 0.002q^2$$

Let $\bar{C}$ be the avg. cost, we divide both sides of eq① by 'q'

$$\bar{C} = f(q) = \frac{C}{q} = \frac{5000000}{q} + 250 + 0.002q.$$

$$f'(q) = 5000000^{-q} + 250 + 0.002q.$$

$$f'(q) = -\frac{5000000}{q^2} + 0.002$$

$$-\frac{5000000}{q^2} + 0.002 = 0.$$

$$q^2 = 2500000000$$

$$q = \pm 50000$$

$$\boxed{q = 50{,}000}$$

$$f''(q) = \frac{10000000}{q^3}$$

$$f''(50{,}000) = \frac{10000000}{(50{,}000)^3}$$

$$\boxed{0.00000008 > 0}$$

It is confirmed that $q = 25$ is the minimum order size.

ⓑ. $\frac{5000000}{50{,}000} + 250 + 0.002(50{,}000)$

$\Rightarrow$ $\boxed{\$450 \text{ per unit}}$

ⓒ. $450 \times 50000 = TC$

$\Rightarrow$ $\boxed{\$22500000}$

SECTION 18.1

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Section # 18.1 :-

* Question # 51

$MR = 40{,}000 - 4x$

$\int MR = \int (40{,}000 - 4x)\, dx$

$R(x) = 40{,}000x - \frac{4x^2}{2}$

$\Rightarrow \boxed{R(x) = 40{,}000 - 2x^2 + c}$

* Question # 52 :-

$MC = 8x + 800$

$\int MC = \int (8x + 800)\, dx$

$C(x) = \frac{8x^2}{2} + 800x$

$C(x) = 4x^2 + 800x + c$

$80{,}000 = 4(40)^2 + 800(40) + c$

$\boxed{C = 41600}$

$\boxed{C(x) = 4x^2 + 800x + 41600}$

* Question # 53 :-

$MP = -6x + 450$

$\int MP = \int (-6x + 450)\, dx$

$P(x) = -\frac{6x^2}{2} + 450x$

$\boxed{P(x) = -3x^2 + 450x + c}$

$5000 = -3(100)^2 + 450(100) + c$

$\boxed{-10{,}000 = c}$

$\boxed{P(x) = -3x^2 + 450x - 10{,}000}$

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* Question # 54:-

$$MP = -3x + 500.$$

$$\int MP = \int (-3x + 500) \, dx.$$

$$\cancel{M} \; P(x) = \frac{-3x^2}{2} + 500. + C.$$

$$15000 = \frac{-3(200)^2}{2} + 500 + c.$$

$$\boxed{C = 74500}$$

$$\boxed{P(x) = \frac{-3x^2}{2} + 500 + 74500}$$

SECTION 18.2

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Section # 18.2:-

*** Question # 1:-**

$\int 60 \, dx.$

$\Rightarrow \boxed{60x + c.}$

*** Question # 3:**

$\int dx/8.$

$\Rightarrow \boxed{1/8 \, x + c}$

*** Question # 2:**

$\int -25 \, dx.$

$\Rightarrow \boxed{-25x + c}$

*** Question # 4:-**

$\int dx.$

$\Rightarrow \boxed{\cancel{4}x + c}$

*** Question # 5:**

$\int 8x \, dx.$

$= \dfrac{8x^2}{2} + c.$

$\Rightarrow \boxed{4x^2 + c}$

*** Question # 6:**

$\int (x/2) \, dx.$

$\Rightarrow \boxed{x^2/4 + c}$

*** ~~Question # 8:~~**

$\cancel{\int (-8x/3) \, dx.}$

$\cancel{= \dfrac{-4x^2}{6} + c.}$

$\cancel{\Rightarrow -2x^2}$

*** Question # 7:**

$\int -3x \, dx.$

$\Rightarrow \boxed{\dfrac{-3x^2}{2} + c}$

*** Question # $\cancel{8}$:**

$\int (-8x/3) \, dx.$

$\Rightarrow \boxed{\dfrac{-4x^2}{3} + c.}$

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* **Question # 8:**

$$\int\left(-\frac{8x}{3}\right)dx.$$

$$I = -\frac{8}{3}\left(\frac{x^{1+1}}{1+1}\right) + c.$$

$$I = -\frac{\cancel{8}}{3}\left(\frac{x^2}{\cancel{2}}\right) + c$$

$$\Rightarrow \boxed{-\frac{4x^2}{3} + c.}$$

* **Question # 9:**

$$\int(3x+6)\,dx.$$

$$\Rightarrow \boxed{\frac{3x^2}{2} + 6x + c.}$$

* **Question # 10:**

$$\int(10-5x)\,dx.$$

$$\Rightarrow \boxed{10x - \frac{5x^2}{2} + c}$$

* **Question # 11:**

$$\int\left(\frac{x}{3} - \frac{1}{4}\right)dx.$$

$$\frac{1}{3}\left(\frac{x^2}{2}\right) - \frac{1}{4}x + c.$$

$$\Rightarrow \boxed{\frac{x^2}{6} - \frac{1}{4}x + c}$$

* **Question # 12:**

$$\int\left(\frac{x}{2} + \frac{1}{4}\right)dx.$$

$$= \frac{1}{2}\left(\frac{x^2}{2}\right) + \frac{1x}{4} + c.$$

$$\Rightarrow \boxed{\frac{x^2}{4} + \frac{x}{4} + c}$$

* **Question # 13:-**

$$\int(3x^2-4x+2)\,dx.$$

$$\frac{3x^3}{3} - \frac{4x^2}{2} + 2x + c.$$

$$\Rightarrow \boxed{x^3 - 2x^2 + 2x + c.}$$