

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

soln.

$$\text{Substitute } f(x) = 0$$

$$0 = (3x^2 + 5)(2x - 1)$$

$$= (3x^2 + 5)(2x - 1) = 0$$

$$3x^2 + 5 = 0 \quad = 3x^2 = -5 \quad \times$$

$$2x - 1 = 0 \quad 2x = 1$$

$$\times \notin \mathbb{R}$$

$$x = \frac{1}{2} \quad \text{or } x = \underline{\underline{0.5}}$$

$$2. f(x) = \frac{6x - 11}{8x + 11}$$

soln. Substitute $f(x) = 0$

$$0 = \frac{6x - 11}{8x + 11}$$

$$= \frac{6x - 11}{8x + 11} \quad x = \frac{11}{6} = \underline{\underline{1\frac{5}{6}}}$$

$$8x + 11 = 0$$

$$\frac{8x}{8} = \frac{-11}{8} \quad x \neq -\frac{11}{8} \text{ (negative No.)}$$

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

soln.

Substitute $f(x) = 0$

$$0 = \frac{(5x - 2)(2x + 3)}{x - 4}$$

$$(5x - 2)(2x + 3) = 0$$

$$x - 4$$

Set the numerator to be equal to zero.

$$(5x - 2)(2x + 3) = 0$$

$$5x - 2 = 0$$

$$2x + 3 = 0$$

$$x_1 = 5x - 2 = 0$$

$$\frac{5x - 2}{5} \quad x_1 = \underline{\underline{\frac{2}{5}}}$$

$$2x + 3 = 0$$

$$\frac{2x}{2} = \frac{-3}{2} \quad x = \underline{\underline{-\frac{3}{2}}}$$

All this is when $x \neq 4$

$$(4) f(x) = (8x + 3)^2$$

soln.

Substitute $f(x) = 0$

$$0 = (8x + 3)^2$$

$$(8x + 3)^2 = 0$$

$$(8x + 3) = 0 \quad \frac{8x}{8} = \frac{-3}{8} \quad x = \underline{\underline{-\frac{3}{8}}}$$

$$x = 0$$

$$5) f(x) = \sqrt{8-5x}$$

soln.

Substitute $f(x) = 0$

$$0 = \sqrt{8-5x}$$

$$\sqrt{8-5x} = 0$$

we let $8-5x = 0$

$$\frac{8x}{5} = \frac{8}{5} \quad x = \frac{8}{5} = \underline{\underline{\frac{3}{5}}}$$

$$6) f(x) = -6x(7x-1)^2$$

soln.

Substitute $f(x) = 0$

$$0 = -6x \times (7x-1)^2$$

$$\frac{-6x}{-6} \times (7x-1)^2 = \frac{0}{-6}$$

$$x(7x-1)^2 = 0$$

$$x_1 = 0$$

$$(7x-1)^2 = 0$$

$$7x-1 = 0$$

$$\frac{7x}{7} = \frac{1}{7} \quad x = \frac{1}{7}$$

$$x_1 = 0, x_2 = \frac{1}{7}$$

$$7) f(x) = -6e^{x+1}$$

soln.

Substitute $f(x) = 0$

$$0 = -6e^{x+1}$$

$$x \in \emptyset$$

The equation has no solution since it has no x intercept.

$$8) f(x) = \ln(5x^2-3x)$$

soln.

Substitute $f(x) = 0$

$$0 = \ln(5x^2-3x)$$

$$0 = \ln(5x^2-3x), x \in (-\infty, 0) \cup (\frac{3}{5}, +\infty)$$

$$\ln(5x^2-3x) = 0$$

Set the argument equal to 1

$$5x^2-3x = 1$$

$$5x^2-3x-1 = 0$$

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 5 \times (-1)}}{2 \times 5}$$

$$x = \frac{3 \pm \sqrt{9+20}}{10}$$

$$x = \frac{3 \pm \sqrt{29}}{10}$$

$$x_1 = -0.3385$$

$$x_2 = 0.8385$$

9.

$$f(x) = \frac{5x^2}{e^x}$$

soln.

Substitute $f(x) = 0$

$$0 = \frac{5x^2}{e^x} \quad x \in \mathbb{R}$$

$$\frac{5x^2}{e^x} = 0 \quad \frac{5x^2}{5} = \frac{0}{5} \quad x^2 = 0$$

Set the base = 0

$$\underline{\underline{x = 0}}$$

$$10) \int_1^2 4x \, dx$$

Soln.

Using properties of integrals

$$4 \int_1^2 x \, dx \\ = 4 \times \frac{x^2}{2} \Rightarrow 2x^2 \Big|_1^2$$

$$\Rightarrow 2x^2 + C \\ (2(2)^2 + C) - (2(1)^2 + C) \\ = 6 + C - 2 - C \\ = 6 - 2 + C - C \\ = \underline{\underline{4}}$$

$$11) \int_0^3 (x^2 + 3x) \, dx$$

Soln

$$\int_0^3 x^2 + 3x \, dx \\ \left(\frac{x^3}{3} + \frac{3x^2}{2} \right) \Big|_0^3 \\ = \left(\frac{3^3}{3} + \frac{3 \times 3^2}{2} \right) - \left(\frac{0^3}{3} + \frac{3 \times 0^2}{2} \right) \\ = \frac{9}{1} + \left(\frac{27}{2} + \frac{27}{2} \right) + 0 \\ 9 + 27 = \frac{18 + 27}{2} = \frac{45}{2} \\ = \underline{\underline{22\frac{1}{2}}}$$

$$12) \int_0^4 (x^2 - 4x + 5) \, dx$$

Soln.

$$\int_0^4 (x^2 - 4x + 5) \, dx$$

$$= \left(\frac{x^3}{3} - 2x^2 + 5x \right) \Big|_0^4$$

$$= \frac{4^3}{3} - (2 \times 4^2) + 5 \times 4 - \left(\frac{0^3}{3} - 2 \times 0^2 + 5 \times 0 \right) \\ = \frac{64}{3} - \frac{32}{1} + \frac{20}{1} \\ = \frac{64 - 96 + 60}{3} = \frac{64 + 60 - 96}{3} \\ = \frac{28}{3} = \underline{\underline{9\frac{1}{3}}}$$

Using integration find the area

$$13) f(x) = 2x - x^2$$

Soln.

We first get the limits.

$$\text{Let } f(x) = 0 \quad 0 = 2x - x^2$$

$$2x - x^2 = 0$$

$$x(2 - x) = 0 \quad x = 0$$

$$2 - x = 0 \quad x = 2$$

∴ Along the X-axis.

$$\int_0^2 (2x - x^2) \, dx \Rightarrow \int_0^2 2x - x^2 \, dx$$

$$= \left(x^2 - \frac{x^3}{3} \right) \Big|_0^2 = 2^2 - \frac{2^3}{3} - \left(0^2 - \frac{0^3}{3} \right) \\ = \frac{4}{1} - \frac{8}{3} = \underline{\underline{\frac{4}{3}}}$$

14. $f(x) = x^2$ and $g(x) = x$

soln.

$f(x) = x^2$

$g(x) = x \Rightarrow gf(x) = x^3$

first we get the limits.

$gf(x) = x^3$

let $gf(x) = 0 \Rightarrow 0 = x^3$

$x^3 = 0$

We set the base equal to zero.

$x = 0$

therefore $gf(x) = x^3 \Rightarrow \int x^3 dx$

$= \left(\frac{x^4}{4} + c \right) \Big|_0 = 0$

15. $f(x) = x^3 - 3x$ and $g(x) = x$

soln.

first we find the limits.

$f(x) = 0 \Rightarrow 0 = x^3 - 3x \Rightarrow x^3 = 3x$

$x^3 - 3x = 0$

$x(x^2 - 3) = 0 \Rightarrow x_1 = 0$

$x^2 - 3 = 0 \Rightarrow x^2 = 3$

$x = -\sqrt{3}$

$x = \sqrt{3}$

$\therefore f(x) = x^3 - 3x$ and $g(x) = x$

$gf(x) = x^4 - 3x^2$

We get the integral of

$gf(x) = x^4 - 3x^2$

$= \int_{-\sqrt{3}}^{\sqrt{3}} x^4 - 3x^2 dx$

$= \left(\frac{x^5}{5} - \frac{3x^3}{3} \right) \Big|_{-\sqrt{3}}^{\sqrt{3}}$

$= \frac{(\sqrt{3})^5}{5} - \frac{(3 \times \sqrt{3})^3}{3} - \left(\frac{(-\sqrt{3})^5}{5} - \frac{(-3 \times \sqrt{3})^3}{3} \right)$

$= \frac{(\sqrt{3})^5}{5} - \frac{3 \times \sqrt{3}^3}{3} - \left(\frac{(-\sqrt{3})^5}{5} - \frac{3 \times (-\sqrt{3})^3}{3} \right)$

$= \frac{9}{4} - \frac{9}{2} - \left(\frac{9}{4} - \frac{9}{2} \right)$

$= \frac{9}{4} - \frac{9}{2} - \frac{9}{4} + \frac{9}{2} = 0$