

Victor Ramos

Lista Semana 14

$$a) \int_3^5 3x^2 dx \Rightarrow x^3 \Big|_3^5 \Rightarrow 5^3 - 3^3 \Rightarrow 125 - 27 = \textcircled{98}$$

$$b) \int_0^{\pi} \sin x dx \Rightarrow -\cos x \Big|_0^{\pi} \Rightarrow -\cos \pi + \cos 0 \Rightarrow 1 + 1 = \textcircled{2}$$

$$c) \int_0^{\pi} \cos x dx \Rightarrow \sin x \Big|_0^{\pi} \Rightarrow \sin \pi - \sin 0 \Rightarrow 0 - 0 = \textcircled{0}$$

$$d) \int_0^{\sqrt{3}} \frac{1}{1+x^2} dx \Rightarrow \arctan x \Big|_0^{\sqrt{3}} \Rightarrow \arctan \sqrt{3} - \arctan 0 = \frac{\pi}{3} - 0 = \textcircled{\frac{\pi}{3}}$$

$$e) \int_1^4 (e^{2x} + \sqrt{x} - 1) dx \Rightarrow \frac{e^{2x}}{2} + \frac{2x\sqrt{x}}{3} - x \Big|_1^4$$

$$\Rightarrow \left(\frac{e^8}{2} + \frac{16}{3} - 4 \right) - \left(\frac{e^2}{2} + \frac{2}{3} - 1 \right) \Rightarrow \frac{e^8}{2} + \frac{4}{3} - \frac{e^2}{2} - \frac{2}{3} + \frac{3}{3}$$
$$= \textcircled{\frac{e^8 - e^2}{2} + \frac{5}{3}}$$

$$2a) \int_2^5 \frac{2x}{x^2-3} dx \Rightarrow \int_2^5 \frac{1}{u} du \Rightarrow \ln |u| \Big|_2^5 \Rightarrow \ln(x^2-3) \Big|_2^5$$

$$u = x^2 - 3 \Rightarrow \ln 22 - \ln 1 = \textcircled{\ln 22}$$
$$du = 2x$$

$$b) \int_0^{\pi/2} \cos^2 x \cdot \sin x dx \Rightarrow \int_0^{\pi/2} u^2 \cdot du \Rightarrow \frac{u^3}{3} \Big|_0^{\pi/2} \Rightarrow \frac{\cos^3 x}{3} \Big|_0^{\pi/2} \Rightarrow$$

$$u = \cos x \Rightarrow 0 - \frac{1}{3} = -\frac{1}{3} = \textcircled{\frac{1}{3}}$$
$$du = -\sin x$$

Victor Ramos

$$c) \int_0^1 \frac{1}{(2x+1)^3} dx \Rightarrow \frac{1}{2} \int_0^1 \frac{1}{u^3} du \Rightarrow \frac{1}{2} \int_0^1 u^{-3} du = \frac{1}{2} \cdot \frac{u^{-2}}{-2} \Big|_0^1 \Rightarrow$$

$$\left. \begin{array}{l} u = 2x+1 \\ du = 2dx \end{array} \right\} \Rightarrow \frac{1}{4} \cdot \frac{1}{u^2} \Rightarrow \frac{1}{4(2x+1)^2} \Big|_0^1 \Rightarrow -\frac{1}{36} - \left(-\frac{1}{4}\right) = \frac{9-1}{36} = \frac{8}{36} = \left(\frac{2}{9}\right)$$

$$3a) \int_2^4 x \cdot \ln x \, dx \Rightarrow \ln x \cdot \frac{x^2}{2} - \int \frac{x^2}{2} \cdot \frac{1}{x} \Rightarrow \ln x \cdot \frac{x^2}{2} - \int \frac{x}{2}$$

$$\left. \begin{array}{l} u = \ln x \quad du = \frac{1}{x} \\ v = \frac{x^2}{2} \quad dv = x \end{array} \right\} \Rightarrow \ln x \cdot \frac{x^2}{2} - \frac{1}{2} \cdot \frac{x^2}{2} \Big|_2^4$$

$$\Rightarrow (\ln 4 \cdot 8 - 4) - (\ln 2 \cdot 2 - 1) = 8 \ln 4 - 2 \ln 2 - 3 = \boxed{7 \ln 4 - 3}$$

$$b) \int_0^{\frac{\pi}{3}} x \cdot \cos x \Rightarrow x \cdot \sin x - \int \sin x \Rightarrow x \cdot \sin x + \cos x \Big|_0^{\frac{\pi}{3}} \Rightarrow$$

$$\left. \begin{array}{l} u = x \quad du = \cos x \\ dv = 1 \quad v = \sin x \end{array} \right\} \Rightarrow \left(\frac{\pi}{3} \cdot \frac{\sqrt{3}}{2} + \frac{1}{2} \right) - (1) \Rightarrow \boxed{\frac{\pi \sqrt{3}}{6} - \frac{1}{2}}$$

$$4) f(x) = 4x^3 + 5; -1 \leq x \leq 1$$

$$\int_{-1}^1 (4x^3 + 5) dx \Rightarrow x^4 + 5x \Big|_{-1}^1 \Rightarrow 6 - (-4) = \boxed{10}$$

$$5) f(x) = -x^2 + 16; -4 \leq x \leq 4$$

$$\int_{-4}^4 -x^2 + 16 \Rightarrow -\frac{x^3}{3} + 16x \Big|_{-4}^4 \Rightarrow \left(-\frac{64}{3} + 64\right) - \left(\frac{64}{3} - 64\right) \Rightarrow$$

$$\Rightarrow -\frac{64}{3} + \frac{192}{3} - \frac{64}{3} + \frac{192}{3} \Rightarrow -\frac{128}{3} + \frac{384}{3} = \boxed{\frac{256}{3}}$$

Victor Ramos

$$6) \int_0^{\frac{\pi}{2}} e^x - \sin x \Rightarrow e^x + \cos x \Big|_0^{\frac{\pi}{2}} \Rightarrow (e^{\frac{\pi}{2}} + 0) - (1 + 1) \Rightarrow$$

$$\Rightarrow e^{\frac{\pi}{2}} - 2$$

$$7) -x^2 + 2x + 15 = 3x + 13 \Rightarrow -x^2 - x + 2 = 0$$

$$\Delta = 1 + 8 = 9$$

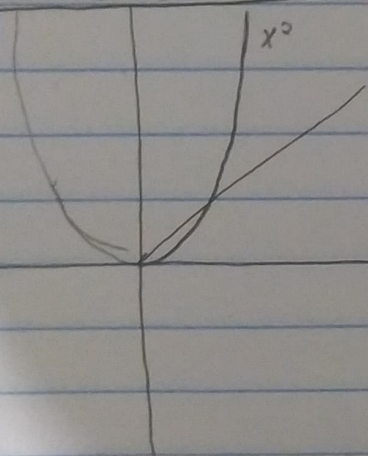
$$x = \frac{1 \pm 3}{-2} \rightarrow -2$$

$$\int_{-2}^1 -x^2 - x + 2 \Rightarrow -\frac{x^3}{3} - \frac{x^2}{2} + 2x \Big|_{-2}^1 \Rightarrow$$

$$\Rightarrow \left(-\frac{1}{3} - \frac{1}{2} + 2\right) - \left(\frac{8}{3} - 2 - 4\right) \Rightarrow \left(-\frac{2}{6} - \frac{3}{6} + \frac{12}{6}\right) - \left(\frac{16}{6} - \frac{12}{6} - \frac{24}{6}\right) \Rightarrow$$

$$\Rightarrow -\frac{2}{6} - \frac{3}{6} + \frac{12}{6} - \frac{16}{6} + \frac{12}{6} + \frac{24}{6} = \frac{27}{6}$$

8)



$$\text{zeros: } x^2 = x \Rightarrow x^2 - x = 0$$

$$\Delta = 1 - 0$$

$$\Delta = 1$$

$$x = \frac{1 \pm 1}{2} \rightarrow 1$$

$$\rightarrow 0$$

$$\int_0^1 x - x^2 \Rightarrow \frac{x^2}{2} - \frac{x^3}{3} \Big|_0^1 \Rightarrow \left(\frac{1}{2} - \frac{1}{3}\right) - 0 \Rightarrow \frac{3}{6} - \frac{2}{6} = \frac{1}{6}$$

$$9) x^2 = -x^2 + 2x$$

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

$$\Delta = 4 - 0 = 4$$

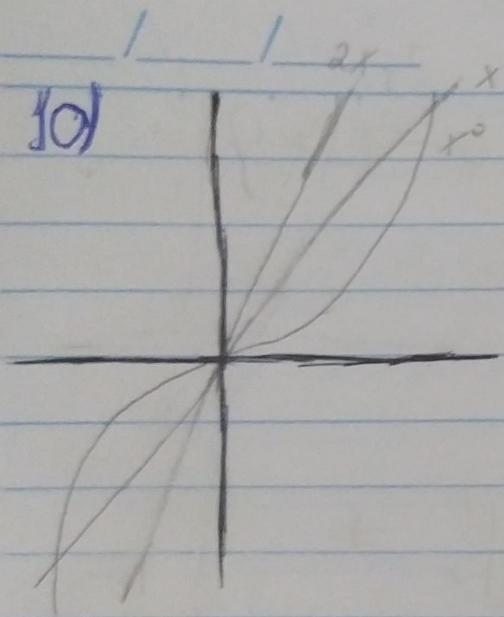
$$x = \frac{2 \pm 2}{2} \rightarrow 1$$

$$4 \rightarrow 0$$

$$\int_0^1 (2x^2 - 2x) dx \Rightarrow 2\frac{x^3}{3} - 2\frac{x^2}{2} \Big|_0^1 \Rightarrow$$

$$\Rightarrow \left(\frac{2}{3} - 1\right) - (0) \Rightarrow \frac{2}{3} - \frac{3}{3} \Rightarrow -\frac{1}{3}$$

Victor Ramos



$$\begin{aligned} 2x &= x^3 \\ 2x - x^3 &= 0 \\ x &= \sqrt[3]{2} \end{aligned}$$

$$\begin{aligned} x^3 &= x \\ x &= 1 \end{aligned}$$

$$\int_0^1 (2x - x) dx \Rightarrow \left. x^2 - \frac{x^2}{2} \right|_0^1 \Rightarrow \left(1 - \frac{1}{2} \right) - 0 = \frac{1}{2}$$

$$\int_1^{\sqrt[3]{2}} (2x - x^3) dx \Rightarrow \left. x^2 - \frac{x^4}{4} \right|_1^{\sqrt[3]{2}} \Rightarrow \left(2 - \frac{4}{4} \right) - \left(1 - \frac{1}{4} \right) \Rightarrow$$

$$\Rightarrow 2 - 1 - 1 + \frac{1}{4} = \frac{1}{4}$$

$$R: \frac{1}{4} + \frac{1}{2} = \frac{1}{4} + \frac{2}{4} = \left(\frac{3}{4} \right)$$