

(5.3) The Fundamental Theorem of Calculus Notes 70**Fundamental Theorem of Calculus**

$$\int_a^b f(x)dx = F(b) - F(a)$$

The Fundamental Theorem of Calculus Solve. Round to the nearest hundredth if irrational.

1) $\int_{-1}^1 (x^3 + x^2 - 2) dx$

$$\frac{x^4}{4} + \frac{x^3}{3} - 2x \Big|_{-1}^1$$

$$\left(\frac{1}{4} + \frac{1}{3} - 2\right) - \left(\frac{1}{4} - \frac{1}{3} + 2\right)$$

$$\frac{2}{3} - 4 =$$

$$\frac{2}{3} - \frac{12}{3} = \boxed{-\frac{10}{3}}$$

2) $\int_0^4 \left(\frac{1}{2}x^2 - 2e^x\right) dx$

$$\frac{1}{6}x^3 - 2e^x \Big|_0^4$$

$$\left(\frac{32}{3} - 2e^4\right) - (0 - 2)$$

$$\frac{32}{3} - 2e^4 + \frac{6}{3} =$$

$$\boxed{\frac{38}{3} - 2e^4}$$

3) $\int_0^{\pi/2} (-3\sin x + \cos x) dx$

$$3\cos x + \sin x \Big|_0^{\pi/2}$$

$$(3(0) + 1) - (3 + 0) =$$

$$\boxed{-2}$$

4) $\int_1^4 (5 + \sqrt{x}) dx$

$$5x + \frac{2}{3}x^{3/2} \Big|_1^4$$

$$\left(20 + \frac{2}{3}(\sqrt{4})^3\right) - \left(5 + \frac{2}{3}\right)$$

$$\left(20 + \frac{2}{3}(8)\right) - \left(5 + \frac{2}{3}\right)$$

$$\frac{60}{3} + \frac{16}{3} - \frac{15}{3} - \frac{2}{3} = \boxed{\frac{59}{3}}$$

$$s) \int_0^5 |3-x| dx$$

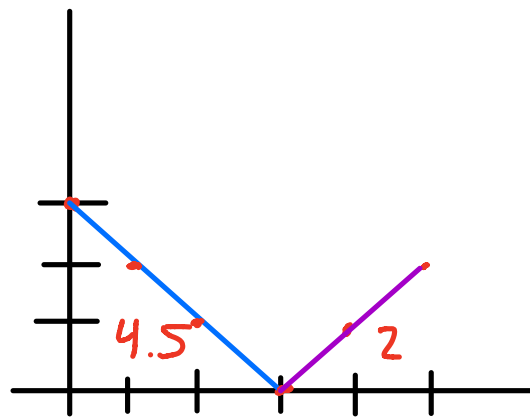
$$\int_0^3 (3-x) dx - \int_3^5 (3-x) dx$$

$$\left(3x - \frac{x^2}{2}\right) \Big|_0^3 - \left(3x - \frac{x^2}{2}\right) \Big|_3^5$$

$$\left(9 - \frac{9}{2}\right) - (0) - \left[\left(15 - \frac{25}{2}\right) - \left(9 - \frac{9}{2}\right)\right]$$

$$4.5 - (2.5 - 4.5) =$$

$$\boxed{4.5} + \boxed{2} = \boxed{6.5}$$



$$b) \int_{-2}^1 |x^3+1| dx$$

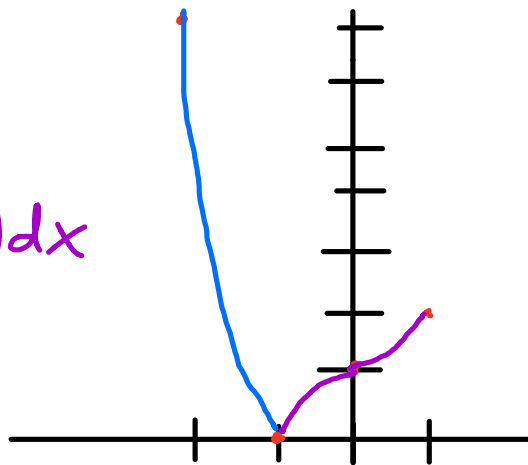
$$- \int_{-2}^{-1} (x^3+1) dx + \int_{-1}^1 (x^3+1) dx$$

$$-\left(\frac{x^4}{4} + x\right) \Big|_{-2}^{-1} + \left(\frac{x^4}{4} + x\right) \Big|_{-1}^1$$

$$-\left[\left(\frac{1}{4} - 1\right) - (4 - 2)\right] + \left(\frac{1}{4} + 1\right) - \left(\frac{1}{4} - 1\right)$$

$$- \left(-\frac{3}{4} - 2\right) + 2$$

$$\frac{3}{4} + 2 + 2 = \boxed{\frac{19}{4}}$$



$$7) \int_{\pi/4}^{5\pi/8} \cos 2x dx$$

$$\frac{1}{2} \sin 2x \Big|_{\pi/4}^{5\pi/8}$$

$$\frac{1}{2} \sin \frac{5\pi}{4} - \frac{1}{2} \sin \frac{\pi}{2}$$

$$\frac{1}{2} \left(-\frac{\sqrt{2}}{2} \right) - \frac{1}{2} = \boxed{-\frac{\sqrt{2}}{4} - \frac{1}{2}}$$