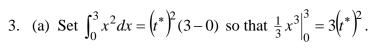


Activity 8.4 – The Fundamental Theorem of Calculus (Part 1)

- 1. (a) $\int_{1}^{\sqrt{2}} \frac{8}{1+x^2} dx = 8 \arctan(x) \Big|_{1}^{\sqrt{2}} = 8 \arctan(\sqrt{2}) 8 \arctan(1) \approx 1.3593$
 - (b) $\int_{1}^{2} \frac{4}{x^{3}} dx = -\frac{2}{x^{2}} \Big|_{1}^{2} = \left(-\frac{2}{4}\right) \left(-\frac{2}{1}\right) = \frac{3}{2}$
 - (c) $\int_0^2 \frac{4}{x^3} dx$ The FTC cannot be used since the integrand is not continuous at x = 0.
 - (d) $\int_0^3 \frac{1}{x-2} dx$ The FTC cannot be used since the integrand is not continuous at x = 2.
 - (e) $\int_{4}^{9} 6\sqrt{x} dx = \frac{6x^{\frac{3}{2}}}{\frac{3}{2}} \Big|_{4}^{9} = 4(9)^{\frac{3}{2}} 4(4)^{\frac{3}{2}} = 76$
 - (f) $\int_0^{\pi} 3\cos x \, dx = 3\sin x \Big|_0^{\pi} = 3\sin \pi 3\sin 0 = 0$
 - (g) $\int_{-1}^{1} e^{5x} dx = \frac{1}{5} e^{5x} \Big|_{-1}^{1} = \frac{1}{5} e^{5} \frac{1}{5} e^{-5} \approx 29.681$
 - (h) $\int_0^{0.5} \frac{1}{\sqrt{1-x^2}} dx = \arcsin x \Big|_0^{0.5} = \arcsin(0.5) \arcsin(0) = \frac{\pi}{6}$
- 2. (a) NOTE THAT THE FOLLOWING COMPUTATION IS INCORRECT!

$$\int_{-1}^{1} \frac{1}{x^2} dx = \int_{-1}^{1} x^{-2} dx = -\frac{1}{x} \Big|_{-1}^{1} = (-1) - (1) = -2$$

(b) The graph is above the x-axis on [-1, 1], so the net area is positive, not negative.



Therefore, $9 = 3(t^*)^2$, and so $t^* = \sqrt{3} \approx 1.732$.

