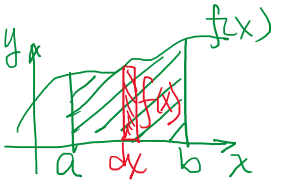
Sec.4.4

p.282-283:

The Fundamental Theorem of Calculus: $\int_a^b f(x)dx = F(b) - F(a)$



Guidelines for Using the Fundamental Theorem of Calculus; Examples 1 - 3

p.292: In Exercises 9–36, evaluate the definite integral.

12. $\int_1^2 (6x^2 - 3x)\,dx$

$= \left[6\cdot\frac{1}{3}x^3 - 3\cdot\frac{1}{2}x^2\right]_1^2 = \left[2x^3 - \frac{3}{2}x^2\right]_1^2$

$= \left[2\cdot 2^3 - \frac{3}{2}\cdot 2^2\right] - \left[2\cdot 1^3 - \frac{3}{2}\cdot 1^2\right] = \frac{19}{2}$

F(x)

$[F(x)+C]_a^b$

$[F(b)+C]-[F(a)+C]$

$F(b)-F(a)$

24. $\int_{-8}^{-1} \frac{x - x^2}{2\sqrt[3]{x}}\,dx$

$= \frac{1}{2}\int_{-8}^{-1} \frac{x - x^2}{x^{1/3}}\,dx = \frac{1}{2}\int_{-8}^{-1} (x^{2/3} - x^{5/3})\,dx$

$= \frac{1}{2}\left[\frac{3}{5}x^{5/3} - \frac{3}{8}x^{8/3}\right]_{-8}^{-1}$

$= \frac{1}{2}\left\{\left[\frac{3}{5}(-1)^{5/3} - \frac{3}{8}(-1)^{8/3}\right] - \left[\frac{3}{5}(-8)^{5/3} - \frac{3}{8}(-8)^{8/3}\right]\right\}$

$= \frac{1}{2}\left\{\left[\frac{3}{5}(-1) - \frac{3}{8}(1)\right] - \left[\frac{3}{5}(-32) - \frac{3}{8}(256)\right]\right\}$

$= \frac{1}{2}\left\{-\frac{3}{5} - \frac{3}{8} + \frac{96}{5} + \frac{768}{8}\right\} = \frac{1}{2}\left\{\frac{4569}{40}\right\} = \frac{4569}{80}$

F(x)

$[16-6]-\left[2-\frac{3}{2}\right]$

$(\sqrt[3]{-8})^5 = (-2)^5$

$(-2)^8$

28. $\int_0^4 |x^2 - 4x + 3|\,dx$

34. $\int_{\pi/4}^{\pi/2} (2 - \csc^2 x)\,dx$

36. $\int_{-\pi/2}^{\pi/2} (2t + \cos t)\,dt$

In Exercises 41– 46, find the area of the region bounded by the graphs of the equations.

42. $y = x^3 + 6x, \quad x = 2, \quad y = 0$

p.284: The Mean Value Theorem for Integrals (see Fig.4.30): $\int_a^b f(x)dx = f(c)(b-a)$

p.292: In Exercises 47–52, find the value(s) of c guaranteed by the Mean Value Theorem for Integrals for the function over the given interval.

50. $f(x) = \frac{9}{x^3}, \quad [1, 3]$

p.285: Average Value of a Function (see Fig. 4.32): $\frac{1}{b-a}\int_a^b f(x)dx \leftarrow f(c)$; Example 4

p.293: In Exercises 53–58, find the average value of the function over the given interval and all values of x in the interval for which the function equals its average value.

54. $f(x) = \frac{4(x^2+1)}{x^2}, \quad [1, 3]$

p.288-289: The Second Fundamental Theorem of Calculus

$\frac{d}{dx}[\int_a^x f(t)dt] = f(x)$, $\frac{d}{dx}[\int_a^{u(x)} f(t)dt] = f(u)u'$; Examples 7 - 8

p.294: Use the Second Fundamental Theorem of Calculus to find $F'(x)$.

80. $F(x) = \int_0^x \sec^3 t\, dt$

84. $F(x) = \int_2^{x^2} \frac{1}{t^3} dt$