

25.4 Definite Integrals

Test Tuesday
24.7, 25.2, 25.4, ?

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

a and b are limits of integration

$$\begin{array}{cc} F(b) & F(a) \\ \downarrow & \downarrow \end{array}$$

$$\text{P. 748} \quad \textcircled{4} \int_0^2 3x^2 dx = 3 \frac{x^3}{3} \Big|_0^2 = x^3 \Big|_0^2 = 2^3 - 0^3 = \boxed{8}$$

$$\begin{aligned} \textcircled{6} \int_4^9 p^{3/2} - 3 dp &= \frac{p^{5/2}}{5/2} - 3p \Big|_4^9 = \frac{2}{5} p^{5/2} - 3p \Big|_4^9 \\ &= \left[\frac{2}{5} (9)^{5/2} - 3(9) \right] - \left[\frac{2}{5} (4)^{5/2} - 3(4) \right] = \left[\frac{2}{5} (243) - 27 \right] - \left[\frac{2}{5} (32) - 12 \right] \\ &= \frac{486}{5} - \frac{64}{5} - 27 + 12 = 69.4 \quad \text{or} \quad \frac{347}{5} \end{aligned}$$

$$\begin{aligned} \textcircled{8} \int_{1.2}^{1.6} \left(5 + \frac{6}{x^2} \right) dx &= \int_{1.2}^{1.6} 5 + 6x^{-2} dx \\ &= 5x + 6 \frac{x^{-1}}{-1} \Big|_{1.2}^{1.6} = 5x - \frac{6}{x} \Big|_{1.2}^{1.6} \\ &= \left[5(1.6) - \frac{6}{(1.6)} \right] - \left[5(1.2) - \frac{6}{(1.2)} \right] \approx 2.669 \end{aligned}$$

$$\begin{aligned} \textcircled{12} \int_1^2 3x^5 - 2x^3 dx &= 3 \frac{x^6}{6} - 2 \frac{x^4}{4} \Big|_1^2 = \frac{1}{2} x^6 - \frac{1}{2} x^4 \Big|_1^2 \\ &= \left[\frac{1}{2} (2)^6 - \frac{1}{2} (2)^4 \right] - \left[\frac{1}{2} (1)^6 - \frac{1}{2} (1)^4 \right] = [32 - 8] - 0 = 24 \end{aligned}$$

P. 748: 3, 5, 7, 11, 13, 35

25.4 Day 2

$$\begin{aligned} \textcircled{18} \int_0^1 x(3x^2-1)^3 dx &= \frac{1}{6} \int_0^1 (3x^2-1)^3 \underline{6x} dx \\ &= \frac{1}{6} \int_{x=0}^{x=1} u^3 du = \frac{1}{6} \frac{u^4}{4} \Big|_{x=0}^{x=1} \\ &= \frac{1}{24} (3x^2-1)^4 \Big|_0^1 \\ &= \left[\frac{1}{24} (3(1)^2-1)^4 \right] - \left[\frac{1}{24} (3(0)^2-1)^4 \right] \\ &= \frac{16}{24} - \frac{1}{24} = \frac{15}{24} \text{ or } \frac{5}{8} = .625 \end{aligned}$$

$$\begin{aligned} u &= 3x^2-1 \\ du &= 6x dx \end{aligned}$$

$$\begin{aligned} \textcircled{24} \int_{12.6}^{17.2} \frac{3 dx}{(6x-1)^2} &= \frac{1}{2} \int_{12.6}^{17.2} (6x-1)^{-2} \underline{2} 3 dx \\ &= \frac{1}{2} \int_{x=12.6}^{x=17.2} u^{-2} du = \frac{1}{2} \frac{u^{-1}}{-1} \Big|_{x=12.6}^{x=17.2} \\ &= -\frac{1}{2} (6x-1)^{-1} \Big|_{12.6}^{17.2} = -\frac{1}{2(6x-1)} \Big|_{12.6}^{17.2} \\ &= -\frac{1}{2(6 \cdot 17.2 - 1)} - \left[-\frac{1}{2(6 \cdot 12.6 - 1)} \right] = .0018 \end{aligned}$$

$$\begin{aligned} u &= 6x-1 \\ du &= 6 dx \end{aligned}$$

Then Sec 25.3