

Math 1a Homework Solutions

Section 5.3

4. By the Total Change Theorem, $\int_0^{15} n'(t) dt = n(15) - n(0) = n(15) - 100$ represents the increase in the bee population in 15 weeks. So $100 + \int_0^{15} n'(t) dt = n(15)$ represents the total bee population after 15 weeks.

6. The slope of the trail is the rate of change of the elevation E , so $f(x) = E'(x)$. By the Total Change Theorem, $\int_3^5 f(x) dx = \int_3^5 E'(x) dx = E(5) - E(3)$ is the change in the elevation E between $x = 3$ miles and $x = 5$ miles from the start of the trail.

$$10. \int_1^2 x^{-2} dx = [-x^{-1}]_1^2 = [-1/x]_1^2 = -\frac{1}{2} - (-1) = -\frac{1}{2} + 1 = \frac{1}{2}$$

$$14. \int_{\pi}^{2\pi} \cos \theta d\theta = [\sin \theta]_{\pi}^{2\pi} = \sin 2\pi - \sin \pi = 0 - 0 = 0$$

$$24. \int_0^5 (2e^x + 4 \cos x) dx = [2e^x + 4 \sin x]_0^5 = (2e^5 + 4 \sin 5) - (2e^0 + 4 \sin 0) = 2e^5 + 4 \sin 5 - 2 \approx 290.99$$

$$47. \int \frac{\sin x}{1 - \sin^2 x} dx = \int \frac{\sin x}{\cos^2 x} dx = \int \frac{1}{\cos x} \cdot \frac{\sin x}{\cos x} dx = \int \sec x \tan x dx = \sec x + C$$

$$56. n(10) - n(4) = \int_4^{10} (200 + 50t) dt = [200t + 25t^2]_4^{10} = 2000 + 2500 - (800 + 400) = 3300$$