Activity 1.4 – Integrals of Constant Functions

1. (a) \( \int 3 \, dx = 3x + C \)

(b) \( \int_{-1}^{4} 3 \, dx = 3x \bigg|_{-1}^{4} = 3(4) - 3(-1) = 15 \)

(c) \( \int_{1}^{3} 3 \, dx = 3x \bigg|_{1}^{3} = 3(3) - 3(1) = 6 \)

(d) \( \int_{-1}^{4} 3 \, dx = 3x \bigg|_{-1}^{4} = 3(4) - 3(-1) = 15 \)

2. (a) \( \int 1 \, dx = x + C \)

(b) \( \int 5.4 \, dt = 5.4t + C \)

(c) \( \int -62 \, du = -62u + C \)

(d) \( \int_{2}^{5} -1 \, dx = (-x) \bigg|_{2}^{5} = (-5) - (-2) = -3 \)

(e) \( \int_{0}^{3} 4.32 \, dx = (4.32x) \bigg|_{0}^{3} = 4.32(3) - 4.32(0) = 12.96 \)

(f) \( \int_{-3}^{2} -0.02 \, dv = (-0.02v) \bigg|_{-3}^{2} = (-0.02(2)) - (-0.02(-3)) = -0.1 \)

3. (a) \( \int v(t) \, dt = \int -45 \, dt = -45t + C \) miles from Bill’s at \( t \) hours

(b) \( \int_{0}^{2} v(t) \, dt = \int_{0}^{2} -45 \, dt = (-45t) \bigg|_{0}^{2} = (-45(2)) - (-45(0)) = -90 \)

Over the first 2 hours, Bill and Sally traveled a net distance of 90 miles westward.

(c) No, we need to know the distance from Bill’s at the start of the trip.

(d) Since \( s(t) = -45t + C \) and \( s(0) = 200 \), \( s(0) = C = 200 \). Therefore, the distance function is \( s(t) = -45t + 200 \) and \( s(2) = -45 \cdot 2 + 200 = 110 \) miles east of Bill’s house.

(e) Part (b) is the net distance traveled, but Part (d) is the distance from Bill’s.

4. \( \int_{-1}^{0} 2 \, dx = (2x) \bigg|_{-1}^{0} = 2(0) - 2(-1) = 2 \)

5. \( \int_{-1}^{1} (2x - 8) \, dx = -[\text{area of trapezoid, or area of rectangle and triangle}] = -16 \)

6. If \( f'(x) = 2 \), then \( f(x) = 2x + C \) and \( f(1) = 2 + C \). Hence, \( C = 5 \) and