

5.3.1

Rules

$$\text{I} \quad \int_a^b f(x) dx = -\int_b^a f(x) dx$$

$$\text{II} \quad \int_a^a f(x) dx = 0$$

$$\text{III} \quad \int_a^b k f(x) dx = k \int_a^b f(x) dx$$

RS 74

$$\text{IV} \quad \int_a^b (f(x) + g(x)) dx = \int_a^b f(x) dx + \int_a^b g(x) dx$$

RS 73

$$\text{V} \quad \int_a^b f(x) dx + \int_b^c f(x) dx = \int_a^c f(x) dx$$

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$$1. \int_7^3 f(x) dx$$

$$-\int_3^7 f(x) dx = -6$$

$$2. \int_2^2 f(x) dx = 0$$

$$3. \int_7^{10} (2f(x) + 3g(x)) dx$$

$$2 \int_7^{10} f(x) dx + 3 \int_7^{10} g(x) dx$$

$$2(-1) + 3(4) = 10$$

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$$\begin{aligned}
 4. & \int_{10}^3 f(x) dx \\
 & - \int_3^{10} f(x) dx \\
 & - \left( \int_3^7 f(x) dx + \int_7^{10} f(x) dx \right) \\
 & - (6 - 1) = -5
 \end{aligned}$$

$$\begin{aligned}
 5. & \int_5^7 f(x) dx \\
 & \int_3^7 f(x) dx - \int_3^5 f(x) dx \\
 & 6 - 2 = 4
 \end{aligned}$$

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Distance: \*  $\int_a^b v(t) dt$

final pos - starting pos  
 \*  $s(b) - s(a)$

$$\int_a^b v(t) dt = s(b) - s(a)$$

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

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$$6. \int_0^1 e^x dx$$

$$(e^x + C) \Big|_0^1 = e^1 + C - (e^0 + C) \\ = e - 1$$

$$7. \int_0^\pi \sin x dx$$

$$-\cos x \Big|_0^\pi = -(\cos \pi - \cos 0) \\ = -(-1 - 1) = -(-2) = 2$$

$$8. \int_1^e \frac{1}{x} dx = \ln x \Big|_1^e = \ln e - \ln 1 = 1$$

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$$9. \int_0^4 x^3 dx$$

$$\frac{1}{4} x^4 \Big|_0^4 = \frac{1}{4} (4)^4 - \frac{1}{4} (0)^4 = 64$$

$$\ast \int x^n dx = \frac{1}{n+1} x^{n+1} + C$$

$$10. \int_0^2 x^2 dx$$

$$\frac{1}{3} x^3 \Big|_0^2 = \frac{1}{3} (2)^3 - \frac{1}{3} (0)^3 = \frac{8}{3}$$

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