Fundamental Theorem of Calculus

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If *f* is a continuous function on [a, b] and *F* is an antiderivative of *f* on [a,b], then

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

Graphically this means: the signed area bounded by $x = a$, $x = b$, $y = f(x)$, and the x-axis.

Evaluate.

**1. $\int_1^2 (4x^3 - 6x)\, dx$

**2. $\int_0^{\pi/4} \sin(x)\, dx$

**3. $\int_0^1 e^{(-4x)}\, dx$

4. $\int_{(\ln 2)}^3 5e^x\, dx$

**5. $\int_1^2 \frac{x - 4}{x^2}\, dx$

**6. If $\int_a^b (f(x))\, dx = a + 2b$, then $\int_a^b ((f(x) + 5))\, dx = ?$

**7. Using the substitution $u = 2x + 1$, $\int_0^2 (\sqrt{2x + 1})\, dx$ is equal to

(A) $\frac{1}{2}\int_{-1/2}^{1/2} \sqrt{u}\, du$ (B) $\frac{1}{2}\int_0^2 \sqrt{u}\, du$ (C) $\frac{1}{2}\int_1^5 \sqrt{u}\, du$ (D) $\int_0^2 \sqrt{u}\, du$ (E) $\int_1^5 \sqrt{u}\, du$

Notes on FTC

1. $\int_{(-1)}^{3} (4x - 2)\, dx$

2. $\int_{-\pi/3}^{\pi/3} (\sec\theta \tan\theta)\, d\theta$

3. $\int_{1/2}^{1} \frac{1}{2x}\, dx$

4. $\int_{0}^{1} \left(x^2 + \sqrt{x}\right)\, dx$

5. $\int_{\pi/6}^{5(\pi)/6} \frac{\csc^2\theta}{2}\, d\theta$

6. $\int_{0}^{3} \left(e^t - t\right)\, dt$

Notes on FTC with U-Substitution

1. $\int_{(-1)}^{0} (1 - 2x)^3 \, dx$

2. $\int_{0}^{\sqrt{\pi}} 5x \cos(x^2) \, dx$

3. $\int_{0}^{3/4} \frac{1}{1 - x} \, dx$

4. $\int_{-1}^{1} (x + 1)(x^2 + 2x - 3)^2 \, dx$

5. $\int_{0}^{2} \frac{3t}{\sqrt{5 - t^2}} \, dt$

6. $\int_{e}^{e^2} \frac{1}{x \ln x} \, dx$