

Integrals - All methods - Solutions

$$1. \int_e^{e^2} \frac{1}{x \ln(x)} dx = \ln 2$$

$$2. \int \tan x \sec^4 x dx = \frac{1}{4} \sec^4 x + C$$

$$3. \int \sqrt{16 - x^2} dx = \frac{1}{2}x\sqrt{16 - x^2} + 8 \arcsin \frac{1}{4}x + C$$

$$4. \int_{\sin \pi/2}^{\ln e} \cos(e^{x^2}) dx = 0 \quad (\text{the limits of integration are both } 1)$$

$$5. \int e^{\sqrt{x}} dx = 2e^{\sqrt{x}}\sqrt{x} - 2e^{\sqrt{x}} + C \quad (\text{try the substitution } u = \sqrt{x}, dx = 2u du)$$

$$6. \int (\ln x)^2 dx = x(\ln x)^2 - 2x \ln x + 2x + C$$

$$7. \int_{-\pi}^{\pi} x e^{\sin(x^2)} dx = 0 \quad (\text{integrand is odd and interval of integration is symmetric about } 0)$$

$$8. \int \left[\int_3^x e^{2t} dt \right] dx = \frac{e^{2x}}{4} - \frac{e^6}{2}x + C$$

$$9. \int \frac{x^2 - x + 6}{x^3 + 3x} dx = \ln|x| - \frac{1}{2} \ln|x^2 + 3| - \frac{1}{\sqrt{3}} \arctan \frac{x}{\sqrt{3}} + C$$

$$10. \int \ln(1 + x^2) dx = x \ln(1 + x^2) - 2x + 2 \arctan x + C \quad (\text{try integration by parts with } u = \ln(1 + x^2), v' = 1)$$

$$11. \int \sqrt[5]{3 - 5y} dy = -\frac{1}{6}(3 - 5y)^{6/5} + C$$

$$12. \int \left[\frac{d}{dx} f(x) \right] dx = f(x) + C$$

$$13. \int \frac{r^2}{r + 4} dr = \frac{r^2}{2} - 4r + 16 \ln|r + 4| + C$$