

AP Calculus
Fives #82
Solutions

I.

$$\int \ln x \, dx$$

$$u = \ln x \quad v = x$$

$$1. \, du = \frac{1}{x} dx \quad dv = dx$$

$$= x \ln x - \int 1 dx$$

$$= x \ln x - x + C$$

$$\int \tan^2 x \, dx = \int \frac{\sin^2 x}{\cos^2 x} dx =$$

$$2. \int \frac{1 - \cos^2 x}{\cos^2 x} dx = \int \sec^2 x - 1 dx =$$

$$\tan x - x + C$$

F.

$$1. \int_{-3}^3 (2\sqrt{9-x^2})^2 dx = 144$$

$$28. \, y = \frac{x}{2} + 2, y = x, x = 0 \dots \text{or} \dots x = 2y - 4, x = y$$

$$a) \text{ WASHER: } x\text{-axis} \rightarrow \int_0^4 \left(\frac{x}{2} + 2 \right)^2 - x^2 dx = 16p$$

$$b) \text{ SHELL METHOD: } y\text{-axis} \rightarrow 2p \int_0^4 x \left(\frac{x}{2} + 2 - x \right) dx = \frac{32p}{3}$$

$$c) \text{ SHELL METHOD: } 2p \int_0^4 (4-x) \left(\frac{x}{2} + 2 - x \right) dx = \frac{64p}{3}$$

$$d) \text{ WASHER: } p \int_0^4 (8-x)^2 - \left[8 - \left(\frac{x}{2} + 2 \right) \right]^2 dx = 48p$$

$$29. \, y = x^3 \quad y = 4x$$

$$a) \text{ WASHER: } p \int_0^2 (4x)^2 - (x^3)^2 dx = \frac{512p}{21}$$

$$b) \text{ WASHER: } p \int_0^2 (8-x^3)^2 - (8-4x)^2 dx = \frac{832p}{21}$$