

Integration by Substitution

Use the substitution $x = u^2$ to find the exact value of

$$\int_0^4 \frac{1}{2 + \sqrt{x}} dx$$

This is clever...

$$\int \frac{2u}{2 + u} du = \int \frac{2u + 4 - 4}{2 + u} du$$

$$= \int \frac{2u + 4}{2 + u} - \frac{4}{2 + u} du$$

$$= \int \frac{2(u + 2)}{u + 2} - \frac{4}{2 + u} du$$

$$= \int 2 - \frac{4}{2 + u} du$$

$$= 2u - 4 \ln(2 + u) + c$$

Now try...

$$\int \frac{5u}{3 + u} du$$

How about...

$$\int \frac{5u}{3 - u} du$$