Check-In 01/15. *(True/False)*

Solution. Making the u-substitution $u = x^2 + 1$ in $\displaystyle\int_0^1 \frac{5x}{x^2+1}\,dx$, we obtain $\displaystyle\int_0^1 \frac{5}{2u}\,du$.

Solution. The statement is *false*. One must always remember to change the limits when making a substitution in a definite integral. If we choose $u = x^2 + 1$, then $du = 2x\ dx$. If $x = 0$, then $u = 0^2 + 1 = 1$. If $x = 1$, then $u = 1^2 + 1 = 2$. But then...

$$\int_0^1 \frac{5x}{x^2+1}\,dx = 5\int_0^1 \frac{x}{x^2+1}\,dx = \frac{5}{2}\int_0^1 \frac{2x}{x^2+1}\,dx = \frac{5}{2}\int_1^2 \frac{du}{u}$$

We also have...

$$\frac{5}{2}\int_1^2 \frac{du}{u} = \frac{5}{2}\ \ln|u|\,\Big|_1^2 = \frac{5}{2}\,(\ln 2 - \ln 1) = \frac{5}{2}\,(\ln 2 - 0) = \frac{5}{2}\,\ln(2) = \ln(\sqrt{32}) \approx 1.73287$$