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Quiz – October 5, 2004

Find

$$\int \frac{x+1}{(x-3)^2} dx.$$

Check your answer.

Answer: Multiply both sides of

$$\frac{x+1}{(x-3)^2} = \frac{A}{x-3} + \frac{B}{(x-3)^2}$$

by $(x-3)^2$ to get:

$$x+1 = A(x-3) + B;$$

so,

$$x+1 = Ax + (-3A+B).$$

Equate the coefficients to see that

$$1 = A, \quad 1 = -3A + B.$$

So, $A = 1$ and $B = 4$. We check that

$$\frac{1}{x-3} + \frac{4}{(x-3)^2} = \frac{(x-3)+4}{(x-3)^2} = \frac{x+1}{(x-3)^2}$$

So, the original problem is equal to

$$\int \frac{1}{x-3} + \frac{4}{(x-3)^2} dx = \boxed{\ln|x-3| - \frac{4}{x-3} + C.}$$

Check: The derivative of the proposed answer is

$$\frac{1}{x-3} + \frac{4}{(x-3)^2}$$

and we have already seen that this is $\frac{x+1}{(x-3)^2}$.