Quiz #5

MATH 126 — Calculus II
Friday, Sept 25

Please print your name:

Problem 1. Expand $\dfrac{5x-13}{(x-3)(x-2)}$ by partial fractions.

Solution. The numerator has degree less than the denominator, and the denominator is already factored for us.

Hence, $\dfrac{5x-13}{(x-3)(x-2)} = \dfrac{A}{x-3} + \dfrac{B}{x-2}$ for some numbers A, B.

To find A, B, we clear denominators: $5x-13 = (x-2)A + (x-3)B$.

Setting $x=3$, we find $2=A$. Setting $x=2$, we find $-3=-B$.

Hence, $\dfrac{5x-13}{(x-3)(x-2)} = \dfrac{2}{x-3} + \dfrac{3}{x-2}$. □

Problem 2. Evaluate the integral $\displaystyle\int_1^2 x\ln(x)\,\mathrm{d}x$.

Solution. We apply integration by parts, and use $\displaystyle\int f(x)g'(x)\mathrm{d}x = f(x)g(x) - \int f'(x)g(x)\mathrm{d}x$ with $f(x)=\ln(x)$ and $g'(x)=x$. With $g(x)=\frac{1}{2}x^2$, we then get

$$\int_1^2 x\ln(x)\,\mathrm{d}x = \left[\frac{1}{2}x^2\ln(x)\right]_1^2 - \int_1^2 \frac{1}{x}\cdot\frac{1}{2}x^2\,\mathrm{d}x = 2\ln(2) - \frac{1}{2}\int_1^2 x\,\mathrm{d}x = 2\ln(2) - \frac{1}{2}\left[\frac{1}{2}x^2\right]_1^2 = 2\ln(2) - \frac{3}{4}.$$

□

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