MATH 101 V2A – Homework
Solutions

January 26th

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1. Calculate

$$\int_0^x e^t \sin(3t)dt$$

using the method of integration by parts.

Solution: Let $u = \sin(3t)$ and $dv = e^t dt$ so that $du = 3\cos(3t)dt$ and $v = e^t$. Using integration by parts gives us that

$$\int_0^x e^t \sin(3t)dt = \sin(3t)e^t \Big|_0^x - \int_0^x 3\cos(3t)e^t dt$$

$$= \sin(3x)e^x - 3\int_0^x \cos(3t)e^t dt.$$

Now let $u = \cos(3t)$ and $dv = e^t dt$ so that $du = -3\sin(3t)dt$ and $v = e^t$. Using integration by parts again gives us that

$$\int_0^x e^t \sin(3t)dt = \sin(3x)e^x - 3\left(\cos(3t)e^t \Big|_0^x - \int_0^x -3\sin(3t)e^t dt \right)$$

$$= \sin(3x)e^x - 3\cos(3x)e^x + 3 - 9\int_0^x \sin(3t)e^t dt.$$

Therefore

$$\int_0^x e^t \sin(3t)dt = \frac{1}{10}\left(\sin(3x)e^x - 3\cos(3x)e^x + 3 \right)$$