Name:
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Math 2B: Quiz 7
Integrate the following

(5) **1.** $\int (\ln(x))^2 dx$

Using integration by parts, let $u = (\ln(x))^2$ then $du = 2x^{-1}\ln(x)dx$ and let $dv = dx$ then $v = x$

$$\int (\ln(x))^2 dx = x(\ln(x))^2 - 2\int \ln(x)dx$$

Using integration by parts again on the second integral, $u = \ln(x), du = x^{-1}dx$ and $dv = dx, v = x$. So

$$\begin{aligned}\int (\ln(x))^2 dx &= x(\ln(x))^2 - 2\left[x\ln(x) - \int dx\right] \\ &= x(\ln(x))^2 - 2x\ln(x) + 2x + C\end{aligned}$$

(5) **2.** $\int \sin^4(x)dx$

Using the two identities $2\sin^2(x) = 1 - \cos(2x)$ and $2\cos^2(x) = 1 + \cos(2x)$ plus some algebra we have

$$\begin{aligned}\int \sin^4(x)dx &= \frac{1}{4}\int (1-\cos(2x))^2 dx \\ &= \frac{1}{4}\int (\cos^2(2x) - 2\cos(2x) + 1)dx \\ &= \frac{1}{4}\int \left(\frac{1+\cos(4x)}{2} - 2\cos(2x) + 1\right)dx \\ &= \frac{1}{8}\int (1 + \cos(4x) - 4\cos(2x) + 2)dx \\ &= \frac{1}{8}\int (\cos(4x) - 4\cos(2x) + 3)dx \\ &= \frac{1}{8}\left[\frac{\sin(4x)}{4} - 2\sin(2x) + 3x\right] + C\end{aligned}$$