Math 465 ASSIGNMENT 5, WINTER 2017 **Due at the start of class on Wed, Feb 22nd**

1. (a) Do one round of integration by parts for $\int x^5 e^x \, dx$.

   (b) Use integration by parts to compute $\int_0^{\frac{\pi}{2}} x \cos x \, dx$, given that $\sin(0) = \cos(\frac{\pi}{2}) = 0$ and $\cos(0) = \sin(\frac{\pi}{2}) = 1$.

   (c) Do one round of integration by parts for $\int_0^{\infty} x^n e^{-x} \, dx$, using the fact that for any positive constant n, $\lim_{x \to \infty} x^n e^{-x} = 0$.

2. Convert each integral by applying the given substitution. *Be sure to convert the limits of integration.*

   (a) $\int_{-1}^{3} (4x + 12) \, dx, \quad x = u - 3$

   (b) $\int_{\frac{1}{4}}^{\frac{1}{2}} \frac{1}{x^2} \, dx, \quad u = \frac{1}{x}$

   (c) $\int_0^1 e^{-4x^2} \, dx, \quad u = 2x$

3. Define a function f by $f(n) = \int_0^2 x^n \, dx$. Find $f(0), f(1)$ and $f(2)$ labelling each clearly as what it is.

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