ESP Math 182 **Spring 2018**

Worksheet 8

8 February 2018

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1. **Warm up:** Using the arc length formula, prove that the circumference of a circle of radius r is $2\pi r$.

2. Evaluate the following integrals. Be careful in choosing which method to use.

   (a) $\displaystyle\int x\ln(x)\,dx$

   (b) $\displaystyle\int x\cos(4x)\,dx$

   (c) $\displaystyle\int e^{4x}\cos(3x)\,dx$

   (d) $\displaystyle\int x^2\sin(x)\,dx$

   (e) $\displaystyle\int x\sin(3x+4)\,dx$

   (f) $\displaystyle\int \sin(3x)\cos(5x)\,dx$

   (g) $\displaystyle\int \frac{x^2-\sqrt{x}}{2x}\,dx$

   (h) $\displaystyle\int (\ln(x))^2\,dx$

   (i) $\displaystyle\int \frac{\ln(\ln(x))}{x}\,dx$

   (j) $\displaystyle\int \tan^2(x)\,dx$

   (k) $\displaystyle\int \sqrt{x}e^{\sqrt{x}}\,dx$

   (l) $\displaystyle\int x\sqrt{x+2}\,dx$

   (m) $\displaystyle\int \frac{x^3}{(x^2+5)^2}\,dx$

   (n) $\displaystyle\int \frac{x^3e^{x^2}}{(x^2+1)^2}\,dx$

3. Prove that $\displaystyle\int xa^x\,dx = a^x\left(\frac{x}{\ln(a)} - \frac{1}{\ln^2(a)}\right) + C$ for any positive number a.

4. Find $f(x)$ if you know that $\displaystyle\int f(x)e^x\,dx = f(x)e^x - \int \frac{e^x}{x}\,dx$.

5. Find $\displaystyle\int (\ln(x))^k\,dx$ for any positive integer k.