ESP Math 182 **Spring 2017**

Worksheet 4

19 January 2017

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1. Find what is wrong with this work. Can you complete it correctly?

   $\int \cos(x)\sin(x)\ dx$

   Let $u = \cos(x)$.

   Then $du = -\sin(x)dx$.

   So the integral is $-\int \cos(x)\ du$.

   This simplifies to $-\sin(x) + C$.

2. Solve these problems by integration by substitution.

   (a) $\displaystyle\int \frac{x}{\sqrt{x^2+9}}\ dx$

   (b) $\displaystyle\int x^2\sin(x^3)\ dx$

   (c) $\displaystyle\int \sin^5(x)\cos(x)\ dx$

   (d) $\displaystyle\int (x^7+2)(x^8+16x-5)^4\ dx$

   (e) $\displaystyle\int \frac{2x-1}{x^2-x}\ dx$

   (f) $\displaystyle\int \frac{x^2 e^{\sqrt{x^3-3}}}{\sqrt{x^3-3}}\ dx$

3. Let $n \geqslant 1$ be an integer.

   (a) Draw the graph of $y = x^n$ on $x \in [0,1]$ for $n = 1, 2, 3$.

   (b) Find the integral of $y = x^n$ on $x \in [0,1]$ for any $n \geqslant 1$.

   (c) What happens to your answer above when $n \to \infty$? Does this make sense?

4. **Bonus:** What is the area bounded between the curves $3 + \sin(x)$ and $3 - \sin(x)$ from $x = 0$ to $x = k\pi$, for any integer k?