ESP Math 182 **Spring 2017**

Worksheet 10

9 February 2017

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1. **Warm Up:** Recall the definition of a polynomial: "a function $f(x) = \sum_{i=0}^{n} a_i x^i$ where $n \in \mathbf{Z}_{\geqslant 0}$ and $a_i \in \mathbf{R}$." Using this definition, decide which of the following functions are polynomials.

   (a) $f(x) = 0$

   (b) $g(x) = 3x + \frac{5}{2}$

   (c) $h(y) = 55y^5 + \frac{\pi^3 y^4}{e^2} + 3y^3 + 22y^2 - 2015.2$

   (d) $i(z) = \frac{z^2}{5} + \frac{5}{z^2}$

   (e) $j(t) = \cos(4t^2)$

   (f) $k(q) = 99q^{99} + e^{99q}$

2. Calculate the following integrals.

   (a) $\displaystyle\int \frac{e^{2t}}{(1+e^{4t})^{3/2}}\, dt$

   (b) $\displaystyle\int \frac{x^2}{x^3 - x^2 + 4x - 4}\, dx$

3. Given that $\int \sec\theta \, d\theta = \ln(|\sec\theta + \tan\theta|) + C$, what is $\int \sec^3\theta \, d\theta$?

4. The *hyperbolic cosine* function $\cosh(x)$ is defined to be:

$$\cosh(x) = \frac{1}{2}(e^x + e^{-x}).$$

Find the arc length of the graph of $\cosh(x)$ on the interval $[-\ln 2, \ln 2]$.

5. The region bounded by the curve $x = (1-y)^2$ and the line $x = 1$ is revolved about the y-axis. Find the volume of the resulting solid.