**Math 31 – Workshop #16**

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1. Compute each of the following integrals or show that it diverges.

   (a) $\displaystyle\int_0^\infty \frac{x}{e^x}\,dx$

   (b) $\displaystyle\int_0^\pi \frac{1}{\cos^2 x}\,dx$

   (c) $\displaystyle\int_0^2 \ln(2-x)\,dx$

2. Consider the region below the graph of $y = e^{-x}$, above the $x$-axis, and to the right of the $y$-axis.

   (a) If this region is rotated about the $x$-axis, what is the resulting volume?

   (b) If this region is rotated about the $y$-axis, what is the resulting volume?

3. Consider the integral $\displaystyle\int_1^\infty x^n\,dx$.

   (a) Find a value for $n$ so that this integral would diverge.

   (b) Find a value for $n$ so that this integral would converge.

   (c) Find all values of $n$ for which this integral would diverge.

4. Consider the integral $\displaystyle\int_0^1 x^n\,dx$.

   (a) Find a value for $n$ so that this integral would diverge.

   (b) Find a value for $n$ so that this integral would converge.

   (c) Find all values of $n$ for which this integral would diverge.