ESP Math 182 **Spring 2017**

Mock final

25 April 2017

1. *Integral methods:* Evaluate the following integrals. Show all your work.

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

   (b) $\displaystyle\int x^2 \sin(2x-5)\,dx$

   (c) $\displaystyle\int_5^7 \frac{x+1}{9x^2+4}\,dx$

   (d) $\displaystyle\int_e^3 \frac{x^2+x-20}{x^3-4x^2+4x}\,dx$

2. *Area between curves:* Find the integral that represents the area above the curve $y = (x-3)^2 - 12$ and below both of the curves $y = (x-2)^3 + 5$ and $y = 7 - x$. Do not evaluate the integral.

3. *Volumes of revolution:* Calculate the following volumes using the disk method.

   (a) The area bounded by $y = \ln(x)$, $y = 4 - \ln(x)$, $x = 2$, and $x = 4$ revolved around the x-axis.

   (b) The area in the second quadrant bounded by $x = -y^2$ and $y = x^2$ revolved around the axis $y = -3$.

   (c) The volume of revolution of $y = x(x-1)(x-2)$ revolved around the x-axis between $x = 0$ and $x = 3$.

4. *Sequences:* For each of the following sequences, determine if it converges or diverges. If it converges find the limit.

   (a) $x_n = \dfrac{n}{n+1}$ (b) $x_n = \dfrac{n\cos(n\pi)}{2n+1}$ (c) $x_n = \dfrac{\sin(n)}{n}$

5. *Series:* Find the intervals of convergence of the following series. Indicate which tests you have used.

   (a) $\displaystyle\sum_{n=2}^{\infty} \frac{(x-2)^n}{(n\ln(n))^2}$

   (b) $\displaystyle\sum_{n=1}^{\infty} \frac{(x-3)^n}{15^n n}$

6. *Parametric equations:*

   (a) Describe the linear system

   $$\begin{aligned} 4x + 5y - 2z &= 7, \\ x - y + 10z &= 1 \end{aligned}$$

   as a parametric equation in the variable t.

   (b) For the parametric curve $(x, y) = (5t - 2, 8 - 3t)$, find $\frac{dy}{dx}$ and the values of t for which the graph is in the first quadrant.

7. *Matrices:* Find the determinant, eigenvalues, and eigenvectors of the matrix $\left[\begin{smallmatrix} \frac{1}{2} & \frac{1}{2} \end{smallmatrix}\right]$.