Math 232 Calculus 2 Fall 17 Sample Final

(1) Find the following integrals.

(a) $\displaystyle\int_0^\infty xe^{-3x^2}\ dx.$

(b) $\displaystyle\int_0^\infty xe^{-3x}\ dx.$

(c) $\displaystyle\int \sin^3 x \cos^2 x\ dx.$

(d) $\displaystyle\int \sin 5x \cos 4x\ dx.$

(2) Find the degree three Taylor polynomial centered at $x = 1$ for the function $f(x) = e^{2x}\ln(x)$.

(3) Consider the volume of revolution formed by rotating the region bounded by $y = 4 - x^2$ in the first quadrant about the y-axis. Find the volume using:
(a) Discs.
(b) Cylindrical shells.

(4) (a) Find the volume of revolution obtained by rotating the curve $y = e^{-4x}$ around the x-axis on the interval $[0, \infty)$.
(b) Write down an integral giving the surface area, but do not evaluate it.

(5) Computer the power series for $f(x) = xe^{-x^2}$ centered at $x = 0$. What is the radius of convergence?

(6) Draw the polar coordinate graph $r = \sin^2(\theta)$. Find the area under curve. Find all the points whose tangent line is vertical.

(7) Find the following integrals

(a) $\displaystyle\int \frac{x^2+3}{x}\ dx.$

(b) $\displaystyle\int \frac{x^2+2}{x+1}\ dx.$

(c) $\displaystyle\int \frac{x}{3x^2+1}\ dx.$

(d) $\displaystyle\int \frac{1}{1+4x^2}\ dx.$

(8) Explain whether the following series converge or diverge, indicating clearly which tests you use.

(a) $\displaystyle\sum_{n=0}^{\infty} \left(\frac{-\sqrt{2}}{e}\right)^n$.

(b) $\displaystyle\sum_{n=0}^{\infty} \frac{1}{2+n^2}$.

(c) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n}{2+n^2}$.

(d) $\displaystyle\sum_{n=0}^{\infty} \frac{10^n}{n!}$.

(9) Consider the sequence $a_n = (2 - \frac{1}{n+1})$.

(a) Does the sequence (a_n) converge? Explain.

(b) Does the series $\displaystyle\sum_{n=0}^{\infty} a_n$ converge? Explain.

(10) Find a parameterization for the parabola $y = 2x^2$ from $(0, 0)$ to $(1, 2)$, and use this to find:

(a) The length of the curve.

(b) The surface area of the shape obtained by rotating this curve around the x-axis.