

Math 1452 Final Exam Fall 2012

Calculators are not allowed on this exam. Work all questions completely. Show all work as described in class. Copyright 2012 Dept of Mathematics and Statistics, Texas Tech University. Unauthorized reproduction prohibited.

- Consider the region bounded by the curves $y = \frac{1}{3}x$ and $y = \sqrt{x}$. Set up integrals to find
 - The area of this region.
 - The volume of the solid generated by rotating this region about the x -axis using **both washers and shells**.
 - The volume of the solid generated by rotating this region about the vertical line $x = -4$ using any method.
- A cylindrical tank has radius of 3 ft and height of 10 ft. It is filled with liquid weighing 76 lb/ft³. Set up an integral to find the work done in pumping out the liquid.
- Evaluate the following integrals.
 - $\int \frac{2x - 9}{x(x^2 + 9)} dx$
 - $\int e^{2x} \cos(3x) dx$
 - $\int x^2 \sin^2(x^3 - 4) dx$
 - $\int \frac{1}{\sqrt{x^2 - 9}} dx$
- Evaluate $\int_0^3 \frac{5}{(x - 2)^2} dx$.
- Indicate if the following series converge or diverge. You must identify all the tests you use and show all the work needed to apply them.
 - $\sum_{k=1}^{\infty} \frac{4k^2 - 3}{k^3 + 2k}$
 - $\sum_{k=1}^{\infty} \frac{(-1)^k}{\sqrt{k}}$
 - $\sum_{k=1}^{\infty} ke^{-k}$
 - $\sum_{k=2}^{\infty} \frac{(2k)!}{3^k}$
- Find the interval and radius of convergence of the power series $\sum_{k=0}^{\infty} \frac{2}{3^k k} (x - 5)^k$.
- Give the Maclaurin series for $f(x) = 3x^5 \sin(2x)$.
- If $\mathbf{u} = \langle 1, 0, 3 \rangle$ and $\mathbf{v} = \langle 2, 1, 0 \rangle$, find
 - $\mathbf{u} - 3\mathbf{v}$
 - $\mathbf{u} \times \mathbf{v}$
 - The angle between \mathbf{u} and \mathbf{v}