

Math 1452 Final Exam Fall 2018

Calculators are not allowed on this exam. Work all questions completely. Show all work as described in class.
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1. Consider the region bounded by the y -axis and the functions $y = x^3$ and $y = 8$.
Set up (but do not evaluate) integrals to find
 - (a) The area of this region.
 - (b) The volume of the solid generated by rotating this region about the y -axis using shells.
 - (c) The volume of the solid generated by rotating this region about the vertical line $x = 5$ using washers.
2. **Set up** (but do not evaluate) an integral to find the work done in pumping a fluid weighing 93 lb/ft^3 out of a cylindrical tank of height 12 ft and radius 5 ft .

3. Evaluate the following integrals.

(a) $\int \frac{1}{\sqrt{x^2 + 9}} dx$

(b) $\int \frac{8x - 2}{x(x^2 + 2)} dx$

(c) $\int e^{3x} \cos(x) dx$

(d) $\int_2^\infty \frac{3}{x(\ln(x))^2} dx$

4. 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.

(a) $\sum_{k=1}^{\infty} \frac{2}{k^k}$

(b) $\sum_{k=5}^{\infty} \frac{(-1)^k}{\sqrt{k} - 2}$

(c) $\sum_{k=4}^{\infty} \frac{k}{k^2 - 9}$

(d) $\sum_{k=2}^{\infty} \frac{(2k)!}{3^k}$

5. Does the sequence $\left\{ \frac{2^k}{3^k} \right\}$ converge? If so, find the limit. If not, explain why not.

6. Does the series $\sum_{k=1}^{\infty} \frac{2^k}{3^k}$ converge? If so, find the limit. If not, explain why not.

7. Find the first 3 terms of the Taylor series for $f(x) = \ln(x)$ centered at 3.

8. Let $\mathbf{u} = \langle 0, 1, -3 \rangle$ and $\mathbf{v} = \langle -4, 3, 0 \rangle$.

- (a) Find $\|\mathbf{u} - \mathbf{v}\|$.
- (b) Find the angle between \mathbf{u} and \mathbf{v} .
- (c) Find $\mathbf{u} \times \mathbf{v}$.