Review Problems for Final Exam
MATH 155 Section 06
Exam Date and Time: May 19th, 2017. 09:00–11:00

Review Problems

1. (8 points) The graph of $f(x) = \sqrt{4x+6}$ on the interval $[0, 5]$ is revolved about the x-axis. What is the area of surface generated?

2. Let R be the region bounded by $y = xe^x$, the x-axis, the line $x = 0$ and the line $x = \ln 2$. Find the area of R.

3. (5 points each) Evaluate or show divergence: (1) $\int_{-\infty}^{\infty} \frac{1}{x^2+4} dx$ (2) $\int_{1}^{\infty} \frac{3x^2+1}{x^3+x} dx$.

4. (3 points each) Compute the limit of the sequence or show divergence:
(1) $\lim_{k\to\infty} \frac{e^k}{k}$. (2) $\lim_{n\to\infty} \frac{\sin(2n)}{n^2}$. (3) $\lim_{n\to\infty} \sum_{k=0}^{n} \frac{1}{e^k}$.

5. Given an infinite series

$$\sum_{n=1}^{\infty} \frac{1}{n^2+1},$$

show that the series is convergent using indicated methods: (1) (3 points) The comparison test. (You can use $\sum_{n=1}^{\infty} \frac{1}{n^2}$ is convergent without proof.) (2) (7 points) The integral test. (You should compute a finite integral you need for comparison.)

6. Determine whether the following series converges: $\sum_{n=1}^{\infty} \frac{\ln n}{n^2}$.

7. Show that the following series is absolutely convergent, convergent, or divergent: $\sum_{n=2}^{\infty} \frac{(-1)^n}{\sqrt{n-1}}$.

8. Write down the degree 4 Taylor polynomial centered at 0:

$$p_4(x) = \sum_{k=0}^{4} \frac{f^{(k)}(0)}{k!} x^k$$

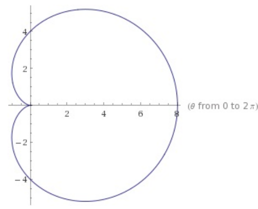
for $f(x) = 1 + \cos x$.

9. Find the interval of convergence of the power series:

$$\sum_{n=2}^{\infty} \frac{5(x-2)^n}{n-1}.$$

(Verify and clearly mention whether your final answer is a(n) open, half-open, or closed interval!)

10. (1) (3 points) Let C be a circle of radius 2 centered at $(2, 0)$. Write the equation of C in the polar coodinate.



(2) (10 points) Calculate the enclosed area by the cardioid $r = 4 + 4\sin\theta$ depicted as above.