

Final Examination (Fall 2010)

Calculus II

Choose any 10 questions. All questions carry equal points.

1) Integrate:

(a) $\int \sin 5\theta \cdot \cos 2\theta \, d\theta$

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

2) Evaluate:

(a) $\int_{\pi/3}^{\pi/2} \frac{\sin x}{\sqrt{1 - 2\cos x}} \, dx$

(b) $\int_0^{\infty} \frac{dx}{\sqrt{x(x+1)}}$

3) Find the area of the region between the graphs of $f(x) = x + 3$ and $g(x) = |2x|$

4) Let R be the region bounded by the curve $f(x) = (x + 1)^2$, the x -axis, and the lines $x = 0$ and $x = 2$. Find the volume of the solid of revolution obtained by revolving R about the x -axis.

5) Find the arc length of the graph of $y = \sqrt{4 - x^2}$ from $x = 0$ to $x = 1$.

6) Use appropriate tests to determine convergence or divergence of the series.
State the test used.

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

(b) $\sum_{k=1}^{\infty} \frac{k!}{k^3}$

7) Classify each series as absolutely convergent, conditionally convergent or divergent.
State the test used.

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

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

8) Find the Maclaurin series expansion of $\frac{1}{1+x}$ and find its interval of convergence.

9) Find the radius of convergence and the interval of convergence

$$\sum_{k=0}^{\infty} \frac{(-1)^k x^k}{3^k (k+1)}$$

10) Sketch the curve by eliminating the parameter t :

$$x = 2 \sin^2 t, \quad y = 3 \cos^2 t \quad (0 \leq t \leq \frac{\pi}{2})$$

11) Find the area of the region in the first quadrant within the cardioid, $r = 1 + \cos \theta$.

Also, find the entire area within the cardioid.