MATH 151 Final Review 2 Spring

1. Find a power series representation for $f(x) = \dfrac{4}{2+x^2}$

2. Find the area inside $r = \sin(\theta)$ and outside $r = 1 - \sin(\theta)$. **Set up** the integral only.

3. Determine if $\displaystyle\sum_{n=2}^{\infty} \frac{(-1)^n (3n)}{2n^2 - 7}$ is **AC**, **CC** or **D**.

4. Determine convergence or divergence of $\displaystyle\sum_{n=1}^{\infty} 2^n \, 3^{-n}$. If convergent, find the sum.

5. Find the length of the curve $x = e^t \cos(t)$, $y = e^t \sin(t)$ on $0 \le t \le \frac{\pi}{2}$

6. Evaluate $\displaystyle\int \sec^4(x) \tan^2(x)\, dx$

7. Evaluate $\displaystyle\int \cos^3(x)\, dx$

8. Determine convergence or divergence. If convergent find what it converges to.

   (a) $a_n = \dfrac{\arctan(n)}{n^3}$

   (b) $a_n = \dfrac{(-1)^n \, n}{n+1}$

9. Determine convergence or divergence of $\displaystyle\sum_{n=1}^{\infty} \frac{10}{\sqrt[3]{n+8}}$

10. Solve $xy' + 2y = \sin(x)$ with $y(\frac{\pi}{2}) = 1$

11. **Set up only** the length of the curve $y = e^{-x}$ on $0 \le x \le 1$.

12. Evaluate $\displaystyle\int \frac{x^3}{\sqrt{1-x^2}}\, dx$

ANSWERS

1) $2\sum_{n=0}^{\infty}\frac{(-1)^n x^{2n}}{2^n}$

2) $\frac{1}{2}\int_{\pi/6}^{5\pi/6}\sin^2(\theta)-(1-\sin(\theta))^2\,d\theta$ **OR** $\int_{\pi/6}^{\pi/2}\sin^2(\theta)-(1-\sin(\theta))^2\,d\theta$ (using symmetry).

3) Conditionally Convergent

4) Converges to 2 (geometric series)

5) $\sqrt{2}(e^{\pi/2}-1)$

6) $\frac{\tan^3(x)}{3}+\frac{\tan^5(x)}{5}+C$

7) $\sin(x)-\frac{\sin^3(x)}{3}+C$

8a) Converges to 0

8b) Diverges

9) Diverges

10) $y=-\frac{\cos(x)}{x}+\frac{\sin(x)}{x^2}+\frac{(\pi/2)^2-1}{x^2}$

11) $\int_0^1\sqrt{1+e^{-2x}}\,dx$

12) $-\left(\sqrt{1-x^2}-\frac{(1-x^2)^{3/2}}{3}\right)+C$