Math 2315 - Calculus 2

Final Exam - 2017.5.01

Name: _____

---

1. Compute the following integral: $\int \cos(\ln(x))\,\mathrm{d}x$
2. Compute the following integral: $\int w^3\sqrt{9-w^2}\,\mathrm{d}w$
3. Compute the following integral: $\int \dfrac{z+1}{z^2+4z-5}\,\mathrm{d}z$
4. Find the exact value of the following sum: $\displaystyle\sum_{k=1}^{\infty} \frac{1}{k(k+1)(k+2)}$
5. Determine if $\displaystyle\sum_{k=1}^{\infty} \frac{(k!)^2}{(2k)!}$ converges or diverges.
6. Determine if $\displaystyle\sum_{k=1}^{\infty} (1-\cos(1/k))$ converges by comparing to the sum $\displaystyle\sum_{k=1}^{\infty} \frac{1}{k^2}$.
7. Define $c_n = \dfrac{1}{n^2+1} + \dfrac{1}{n^2+2} + \cdots + \dfrac{1}{n^2+n}$. Show that for all n, $\dfrac{n}{n^2+n} \le c_n \le \dfrac{n}{n^2+1}$.
8. Using the result above from problem 7, determine if $\{c_n\}_{n=1}^{\infty}$ converges, and if so, to what value.
9. Convert the polar coordinate $(6, 3/4\pi)$ to rectangular coordinate form.
10. Convert $(-6/\sqrt{2}, 6/\sqrt{2})$ to polar coordinate form, and give three distinct answers.
11. Plot the polar function $r = 2 + 2\cos(3\theta)$, for $0 \le \theta \le 2\pi$.
12. Compute the tangent line to polar function $r = 2 + 2\cos(3\theta)$ at $\theta = 2/3\pi$.
13. Compute the interval of convergence for the power series: $\displaystyle\sum_{k=0}^{\infty} \frac{(-1)^k x^k}{\sqrt{k^2+1}}$.
14. Express the following integral as an infinite series: $\displaystyle\int_0^x \frac{1-\cos(t)}{t}\,\mathrm{d}t$.
15. Find the Maclaurin series for $f(x) = x^2 e^{x^2}$.
16. Plot the parametric function $(x(t), y(t)) = (\cos(t)\sin(t), \sin(t))$, for $t \in [0, 2\pi]$.
17. Find the exact value of the following sum: $\displaystyle\sum_{k=2}^{\infty} 3\left(\frac{4}{5}\right)^k$
18. Determine if the following series converges absolutely, conditionally, or diverges: $\displaystyle\sum_{k=1}^{\infty} (-1)^k \frac{1}{\sqrt[3]{k}+2k}$