AP Calculus BC **Name:** _____
Midterm Review

1. What are all of the horizontal asymptotes of all the solutions of the logistics differential equation $\frac{dy}{dx} = y(16 - 2y)$?

2. $\int sec^5 x tan^3 x dx =$

3. Evaluate the integral: $\int e^x cosx dx$

4. What is the carrying capacity for a population whose growth rate is modeled by $\frac{dP}{dt} = 45P - 9P^2$?

5. Evaluate the integral: $\int \frac{5}{x^2+8x+18} dx$

6. Evaluate the integral: $\int sin^3(x)\, cos^2(x) dx$

7. $\int -5x cos2x dx$

8. $\int \frac{4x-1}{x^2-3x-40} dx$

9. $\int x cos(2\pi x^2) dx$

10. Evaluate the integral: $\int x\sqrt{x+1} dx$

11. Evaluate the integral: $\int 3x(x^2 - 1)^4 dx$

12. $\int \frac{5}{\sqrt{1-16x^2}} dx$

13. Which of the following integrals are divergent?

I. $\int_2^\infty \frac{x}{(1+x^2)^2 dx}$ II. $\int_1^\infty \frac{1}{x} dx$ III. $\int_2^\infty cos2x\, dx$

14. What is the value of $\sum_{n=0}^{\infty}\left(-\frac{1}{3}\right)^n$?

15. Which of the following series converges?

I. $\sum_{n=1}^{\infty}\frac{1}{\sqrt{n}}$ II. $\sum_{n=1}^{\infty}\frac{3^n}{n!}$ III. $\sum_{n=1}^{\infty}\left(\frac{e}{\pi}\right)^n$

16. Determine whether the following sequence converges or diverges. If it converges, find its limit.

$\left\{\frac{(n-2)!}{(n+1)!}\right\}$, $n = 0, 1, 2, \ldots$

17. Investigate $\sum_{n=1}^{\infty}\frac{(-1)^{n+1}}{n}$ for convergence or divergence.

18. Find the third term of the sequence $\left\{\frac{(-1)^n(2^n+1)}{n!}\right\}$, $n = 1, 2, 3, \ldots$

19. Determine whether the series $\sum_{n=1}^{\infty}\frac{(-1)^n}{\sqrt{n}}$ is convergent or divergent. If convergent, classify the series as absolutely convergent or conditionally convergent.

20. Find the number of terms necessary to approximate the sum of the series $\sum_{n=1}^{\infty}\frac{(-1)^{n+1}}{n+1}$ with an error of less than or equal to 0.001.

21. Determine if the following sequence converges or diverges. If it converges, find its limit.

$\left\{\frac{5n-1}{3n+1}\right\}$, $n = 1, 2, 3, \ldots$

22. Determine which series diverges.

a) $\sum_{n=0}^{\infty}\frac{n!}{6n!-1}$ b) $\sum_{n=1}^{\infty}\frac{1}{n^6}$ c) $\sum_{n=0}^{\infty}5\left(\frac{1}{10}\right)^n$ d) $\sum_{n=0}^{\infty}\frac{n}{2^n}$

23. Determine if the series converges or diverges. $\sum_{n=1}^{\infty}\frac{3}{(2n-1)(2n+1)}$.

24. Determine if the series converges or diverges. $\sum_{n=1}^{\infty}\left(\frac{2n-1}{3n+5}\right)^n$

25. Which of the following series converge?

I. $\sum_{n=1}^{\infty}\frac{n}{n+5}$ II. $\sum_{n=1}^{\infty}\frac{1}{n-3}$ III. $\sum_{n=1}^{\infty}\frac{1}{n}$

26. What is the radius of convergence for the power series $\sum_{n=0}^{\infty}\frac{(x-5)^n}{2\cdot 3^{n+1}}$?

27. Find the interval of convergence for a power series that is centered at -2 for the function $f(x)=\frac{3}{2-4x}$.

28. Let f be the function given by $f(x)=\ln(3-x)$. The third-degree Taylor polynomial for f about $x=2$ is

29. Write out the first four terms of the Taylor series for f(x) = xcosx about x = 0.

30. The third-degree Taylor polynomial for a function f about x = 4 is $\frac{(x-4)^3}{512}-\frac{(x-4)^2}{64}+\frac{(x-4)}{4}+2$. What is the value of $f''(4)$?

31. Let f be a function with $f(3)=2,\ f'(3)=-1,\ f''(3)=6,$ and $f'''(3)=12.$ Which of the following is the third-degree Taylor polynomial for f about $x=3$?

32. Find the interval of convergence of the Maclaurin series for $f(x)=e^{-2x}$.

33. Use the 4th degree Taylor Series for sinx about x = 0 to determine whether f has a relative minimum, relative maximum, or neither at x = 0.

34. If $f(x)=e^{-x^2}$. Write the first four nonzero terms of the Taylor series for $\int_0^x e^{-t^2}dt$ about x = 0,