Math1220
Spring, 2009
Final Quiz (#11)

1. Evaluate $D_x\left(x^{1+x}\right)$.

   (a) $(1+x)x^x$

   (b) $(\ln x)x^{1+x}$

   (c) $\frac{1+x}{x}+\ln x$

   (d) $x^{1+x}\left(\frac{1+x}{x}+\ln x\right)$

2. Evaluate $\int e^x \sin(e^x)\,dx$.

   (a) $-\cos x+C$

   (b) $-\cos(e^x)+C$

   (c) $\cos x+C$

   (d) $\cos(e^x)+C$

3. For $f(x)=x^5+2x^3+4x$ we can prove it's a monotonically increasing function and therefore has an inverse function. Find (1) $f^{-1}(7)$ and (2) $(f^{-1})'(7)$.

   (a) $(1)1;\ (2)\frac{1}{12303}$

   (b) $(1)1;\ (2)12303$

   (c) $(1)17521;\ (2)12303$

   (d) $(1)1;\ (2)\frac{1}{15}$

4. If $500 is put in the bank today at 9% interest compounded monthly, how much will it be worth in 10 years?

   (a) $1183.68

   (b) $538.79

   (c) $1225.68

   (d) $546.90

5. Find the equation of the tangent line to $y=(\sin x+1)^{\cos x}$ at $x=\frac{\pi}{2}$.

   (a) $y=(-\ln 2)x+1+\frac{\pi}{2}\ln 2$

   (b) $y=\ln\left(\frac{1}{2}\right)x-1+\frac{\pi}{2}\ln\left(\frac{1}{2}\right)$

   (c) $y=1$

   (d) $y=(-\ln 2)x+\frac{\pi}{2}\ln 2$

6. Solve this differential equation $\frac{dy}{dx}+2xy-2x=0$ if it goes through (0, 3).

(a) $y=1$
(b) $y=1+c\,e^{-x^2}$
(c) $y=1+2e^{-x^2}$
(d) $y=1-3x^2$

7. Evaluate the integral. $\int \frac{x+9}{x^3+9x}\,dx$

(a) $\ln|x|+\frac{1}{3}\arctan\left(\frac{x}{3}\right)+C$
(b) $x\ln x+C$
(c) $\ln|x|-x\ln(x^2+9)+\frac{1}{3}\arctan\left(\frac{x}{3}\right)+C$
(d) $\ln|x|+\frac{1}{3}\arctan\left(\frac{x}{3}\right)-\ln\sqrt{x^2+9}+C$

8. Evaluate the integral. $\int \frac{\cos x(\sin x+\cos x)}{\sin x}\,dx$

(a) $\sin x+\ln|\sin x|+C$
(b) $\sin x+\cos x+\ln|csc\,x-\cot x|+C$
(c) $\sin x+\ln|csc\,x-\cot x|+C$
(d) $\cos x+\ln|\sin x|+C$

9. Evaluate the integral. $\int_0^4 \frac{x}{\sqrt{9+x^2}}\,dx$

(a) 2
(b) 1
(c) 4
(d) 0

10. Evaluate the integral. $\int_3^7 \frac{2x}{\sqrt{x-3}}\,dx$

(a) $\frac{52}{3}$
(b) $\frac{64\sqrt{7}}{3}-16\sqrt{3}$
(c) diverges
(d) $\frac{104}{3}$

11. Evaluate the integral. $\int x^2 \ln x \, dx$

(a) $-x+C$

(b) $\frac{1}{3}x^3 \ln x - \frac{1}{3}x^3 + C$

(c) $\frac{1}{2}x^2 \ln x - \frac{1}{4}x^2 + C$

(d) $\frac{1}{3}x^3(\ln x - \frac{1}{3}) + C$

12. Find the limit. $\lim_{x \to 0} (1+\sin x)^{\frac{2}{x}}$

(a) 2

(b) e^2

(c) 1

(d) e^{-2}

13. Find the limit. $\lim_{x \to 0} \frac{\sin x - \tan x}{x^2 \sin x}$

(a) $\frac{1}{2}$

(b) 0

(c) $-\frac{1}{2}$

(d) 1

14. Evaluate the integral. $\int_{\frac{1}{2}}^{2} \frac{dx}{x \sqrt[3]{(\ln x)}}$

(a) 0

(b) $2 \ln 2$

(c) $3(\ln 2)^{\frac{2}{3}}$

(d) diverges

15. Given the sequence $a_n = \frac{1}{\sqrt[3]{n}} + \frac{1}{\sqrt[n]{3}}$, does it converge or diverge? If it converges, what does it converge to?

(a) diverges

(b) converges to 1

(c) converges to 0

(d) converges to $\frac{1}{3}$

(di)

16. Determine the convergence of this series. $\sum_{n=1}^{\infty} \frac{(-3)^n n^2}{(2n)!}$.

(a) converges absolutely
(b) converges conditionally
(c) diverges

17. Determine the convergence of this series. $\sum_{n=1}^{\infty} \frac{2n+7}{\sqrt{4n^4+5n+1}}$.

(a) converges absolutely
(b) converges conditionally
(c) diverges

18. Determine the convergence of this series. $\sum_{n=1}^{\infty} \frac{3n^3+2n}{1+n^3}$.

(a) converges absolutely
(b) converges conditionally
(c) diverges
(ci)

19. Find the convergence set for this power series. $\sum_{n=0}^{\infty} \frac{(x-3)^n}{2^n+1}$

(a) $(-\infty, \infty)$
(b) $[1,5)$
(c) $(1,5)$
(d) $[2,4]$

20. Find the Taylor polynomial of order 4 centered at x = 2 for $f(x)=\frac{2}{x-1}$.

(a) $2(1-(x-2)+(x-2)^2-(x-2)^3+(x-2)^4)$
(b) $-2(1+x+x^2+x^3+x^4)$
(c) $2(1-(x-2)+\frac{1}{2}(x-2)^2-\frac{1}{6}(x-2)^3+\frac{1}{24}(x-2)^4)$
(d) $2(1-\frac{1}{2}(x-2)+\frac{1}{2}(x-2)^2-\frac{1}{2}(x-2)^3+\frac{1}{2}(x-2)^4)$

21. For $f(x)=\frac{2}{x-1}$, find the error in computing f(1.5) using the 4th order Taylor polynomial (found in problem #20).

(a) $\frac{1}{16}$
(b) $\frac{1}{40}$
(c) 4
(d) $\frac{4}{5}$

22. Find the polar coordinates for the rectangular coordinates $(-3, \sqrt{3})$.

(a) $(2\sqrt{3}, \frac{-\pi}{6})$

(b) $(2\sqrt{3}, \frac{5\pi}{6})$

(c) $(2\sqrt{3}, \frac{\pi}{3})$

(d) $(-2\sqrt{3}, \frac{-\pi}{3})$

23. Find the rectangular coordinates for the polar coordinates $(-1, \frac{5\pi}{4})$

(a) $\left(\frac{-\sqrt{2}}{2}, \frac{-\sqrt{2}}{2}\right)$

(b) $\left(\frac{\sqrt{2}}{2}, \frac{-\sqrt{2}}{2}\right)$

(c) $\left(\frac{-\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

(d) $\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

24. Find the Cartesian equation for the polar equation. $r^2 - 6r\cos\theta - 4r\sin\theta + 9 = 0$

(a) $(x-2)^2 + (y-3)^2 = 4$

(b) $(x-3)^2 + (y-2)^2 = 4$

(c) $y = x - 1$

(d) $\frac{(x-2)^2}{9} + \frac{(y-3)^2}{4} = 1$

25. Find the power series and the radius of convergence for $f(x) = \frac{3x^2}{4 - x^3}$.

(a) $\sum_{n=0}^{\infty} \frac{3x^{3n+2}}{4^{n+1}}; \sqrt[3]{4}$

(b) $\sum_{n=0}^{\infty} \frac{3x^{3n+2}}{4}; 1$

(c) $\sum_{n=0}^{\infty} \frac{3x^{n+2}}{4^n}; 4$

(d) $\sum_{n=0}^{\infty} \frac{3x^{2n}}{4^{n+1}}; 1$