CONTINUOUS ASSESMENT

COURSE TITLE: Mathematical Methods 1 (MTH 218)

INSTRUCTION: ANSWER ALL QUESTIONS.

1. Given that $u = x^2 + 2xy - y\ln z$ and $x = s + t^2$, $y = s - t^2$, $z = 2t$. Find $\frac{\partial u}{\partial s}$

a. $4x + 2y - \ln z$ b. $6s + 2t^2 - \ln 2t$ c. $4t(s - t^2) + 2t\ln 2t - \frac{(s - t^2)}{t}$ d. $4t^2 + 4s - \ln t$ e. none of the above

2. If $x = r\cos\theta$, $y = r\sin\theta$. Evaluate $\frac{\partial(x, y)}{\partial(r, \theta)}$.

a. $r$ b. $\cos\theta$ c. $-r\sin\theta$ d. $\sin\theta$ e. none of the above

3. If $u = e^{xy}$, find the value of $\frac{\partial^2 u}{\partial x \partial y}$

a. $xye^{xy}$ b. $xe^{xy} + 1$ c. $xye^{xy} + 1$ d. $e^{xy}(xy + 1)$. E. none of the above

4. Expand $f(x, y) = \sin x \cos y$ at (0,0) ignoring terms higher than degree 3.

a. $\cos x \cos y + R_3$ b. $1 + R_3$ C. $x + R_3$ d. $0 + R_3$ e. none of the above

5. Simplify $\left(\frac{1 + \cos 2\theta + i\sin 2\theta}{1 + \cos 2\theta - i\sin 2\theta}\right)^{30}$ .a. $\sin 30\theta + \cos 30\theta$ b. $\cos 60\theta + i\sin 60\theta$ c. $\cos 2\theta + i\sin 2\theta$ d. $1 - \cos\theta + i\sin 2\theta$ e. none of the above

6. Investigate the nature of the function $z = x^3 + xy + y^2$ at (0,0).

a. Relative minimum b. Relative maximum c. Saddle point d. none of the above d. all of the above.

7. If $f(x,y)=x^2+xz+2y^2, z=2xy, \frac{\partial f}{\partial x}$. a. $2x+4xy$ b. $4x+2xy$ c. $2x-4xy$ d. $4x-2xy$ e. none of the above

8. If $z=a+ib$, then $\bar{z}$ is equal to a. $a-ib$ b. $a+\bar{b}$ c. $x+iy$ d. $x-iy$ e. none of the above

9. Let $z^n=\cos n\theta+i\sin\theta$ and $\bar{z}^n=\cos n\theta-i\sin n\theta$. Find $z^n+\frac{1}{z^n}$ a. $-2\cos n\theta$ b. $2\cos n\theta$ c. $2\sin n\theta$ d. $-2\sin n\theta$ e. none of the above

10. Express in polar form, $z=1-i\sqrt{3}$. A. $2(\cos\frac{5\pi}{3}+i2\sin\frac{5\pi}{3})$ b. $-2(\cos\frac{5\pi}{3}+i\sin\frac{5\pi}{3})$ c. $2(\cos\frac{5\pi}{3}-i\sin\frac{5\pi}{3})$ d. $2(\cos\frac{5\pi}{3}+i\sin\frac{5\pi}{3})$ e. none of the above

11. If $z_1=2-3i,\ z_2=4+6i$. Find $z_1-z_2$. a. $2+9i$ b. -2-9i c. 8+2i d. -8-9i e. none of the above

12. If $z_1=2-3i, z_2=4+6i.$ Find $z_1z_2$. a. 8+18i b. -8-18i c. 26 d. 2-6i

13. Find $\frac{5-2i}{3-i}$ a. $\frac{17}{10}+\frac{-1}{10}i$ b. $\frac{1}{5}+\frac{1}{5}i$ c. $\frac{2}{5}-\frac{2}{5}i$ d. $\frac{-2}{5}+\frac{1}{5}i$ e. none of the above

14. Find the conjugate of the complex number $2i(-3+8i)$. a 6+6i b. 6-6i c. 2-6i d. -16+6i e. none of the above

15. Evaluate $\int xe^x dx$ a. $e^x(x-1)+c$ b. $x-1+c$ c. $e^x-1+c$ d. $e^x+1+c$ e. none of the above

16. Evaluate $\int \cos x dx$ a. cosx + c b. sinx + c c. –sinx + c d. –cosx + c e. none of the above

17. Find the definite integral $\int \sin^2 x dx$ a. $2x-\frac{1}{4}\sin x+c$ b. $x+\frac{1}{4}\sin x+c$ c. $\frac{1}{2}x-\frac{1}{4}\sin 2x+c$ d. $2\sin x-\cos x+c$ e. none of the above

18. Solve $\int \cos^3 x dx$ a. $3\cos 3x+x$ b. $\frac{\cos 3x}{3}+c$ c. $\sin 3x-3\cos 3x+c$ d. $\sin x-\frac{1}{3}\sin^3 x+c$ e. none of the above

19. Evaluate $\frac{(2x+3)}{(x-1)(x-2)(2x-3)}dx$ a. $\ln(2x+3)+c$ b. $\ln\left\{\frac{(x-1)^5(x-2)^7}{(2x-3)^{12}}\right\}+c$ c. $\ln\frac{x-1}{x-2}+c$ d. $\frac{(x-1))x-2)}{2x-3}+c$ e. none of the above

20. Evaluate $\int \log x dx$ a. $\log x + c$ b. $x\log x + c$ c. $\frac{1}{x}+c$ d. $x\log x - x + c$ e. none of the above

21. Evaluate $\int x\sin x dx$ a. $-x\cos x + \sin x + c$ b. $\sin x + \cos x + c$ c. $\frac{\cos x}{x}+c$ d. $\sin x\cos x + c$ e. none of the above

22. Expand $f(x,y)=\sin x\cos y$ about the point (0,0) ignoring terms higher than degree3. a. $x+y+R_3$ b. $x^2+y^2+R_3$ c. $x+R_3$ d. $\sin x\sin y + R_3$ e. none of the above

23. A function $f(x,y)$ is said to have a relative minimum value at a point $p(x_0,y_0)$ if a. $\frac{\partial f}{\partial x}=\frac{\partial f}{\partial y}$ b. $\Delta f(x_0+h,y_0+k)=0$ c. $\Delta f(x_0+h,y_0+k)<0$ d. $\Delta f(x_0+h,y_0+k)>0$ e. none of the above

24. At the stationary point $(x_0,y_0)$, a relative maximum exists if a. $\frac{\partial^2 f}{\partial x^2}\frac{\partial^2 f}{\partial y^2}=\frac{\partial^2 f}{\partial x\partial y}$ b. $\frac{\partial^2 f}{\partial x^2}(x_0,y_0)<0$ and $\frac{\partial^2 f}{\partial x^2}\frac{\partial^2 f}{\partial y^2}>\left[\frac{\partial^2 f}{\partial x\partial y}\right]^2$ c. $\frac{\partial^2 f}{\partial x^2}(x_0,y_0)<0$ and $\frac{\partial^2 f}{\partial x^2}\frac{\partial^2 f}{\partial y^2}<\left[\frac{\partial^2 f}{\partial x\partial y}\right]^2$ d. $\frac{\partial y}{\partial y}>0$

e. none of the above

25. A saddle point exists if a. $\frac{\partial^2 f}{\partial x^2}\frac{\partial^2 f}{\partial y^2}=\left[\frac{\partial^2 f}{\partial x\partial y}\right]^2$ b. $\frac{\partial^2 f}{\partial x^2}\frac{\partial^2 f}{\partial y^2}>\left[\frac{\partial^2 f}{\partial x\partial y}\right]^2$ c. $\frac{\partial^2 f}{\partial x^2}=\frac{\partial^2 f}{\partial y^2}$ d. $\frac{\partial^2 f}{\partial x^2}=\left[\frac{\partial^2 f}{\partial x\partial y}\right]^2$ e. none of the above

26. Determine the nature $f(x,y)=x^2+4x^2y^2-2x+2y^2-1$ at point (-1,0). a. Relative maximum b. Relative minimum c. Saddle point d. all of the above e. none of the above

27. Evaluate $\int\frac{1}{x}dx$. a. $\ln x + c$ b. $x^2+c$ c. $\frac{1}{x}+c$ d. $\frac{x}{2}+c$ e. none of the above

28. If $z=x+iy$ and $\bar{z}=x-iy$, find $z\bar{z}$. a. $x+y$ b. $r^2$ c. $2x+2y$ d. $x-y$ e. none of the above

29. Express $\cos^6\theta$ in multiple angles. a. $6\cos 6\theta$ b. $\cos^6\theta + 6\cos\theta$ c. $\sin 6\theta \cos 6\theta$ d. $\frac{1}{32}[\cos 6\theta + 6\cos 4\theta + 15\cos 2\theta + 10]$ e. none of the above

30. Solve $z^4 = -1$ a. $\cos\frac{\pi + 2\pi k}{4} + i\sin\frac{\pi + 2\pi k}{4}$ b. 1 c.0 d. -1 e. none of the above

31. A real valued function f(x) is said to be continuous at a point a if: a. f(x) is defined b. $\lim_{x\to a} f(x)$ exists c. $\lim_{x\to a} f(x) = f(a)$ d. all of the above e. none of the above

32. If $u = e^x \cos y$, find the value of $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial^2 y}$ a. 1 b. 0 c. $e^x \sin y$ d. $-e^x \cos y$ e. none of the above

33. Evaluate $\int e^x dx$. a. $e^x + c$ b. $\frac{e^x}{x} + c$ c. $xe^x + c$ d. $e^{x+1} + c$ e. none of the above

34. Solve $\int x^3 dx$ a. $3x^2 + c$ b. $2x + c$ c. $\frac{x^4}{4} + c$ d. $x^4 + c$ e. none of the above

35. If $z = \cos\theta + i\sin\theta$ and $\frac{1}{z} = \cos\theta - i\sin\theta$, find $z - \frac{1}{z}$ a. $\sin 2\theta$ b. $2i\sin\theta$ c. $\sin\theta + \cos\theta$ d. $\cos\theta - i\sin\theta$ e. none of the above