MAC2313 Review 2 Answer

1. (1) $\{(x,y)\,|\,x+y>-1\}$ (2) $\{(x,y)\,|\,x^2+y^2\le 4 \text{ and } -1\le x\le 1\}$

2. Choose two different paths to get two different limits

3. 3; 4; 2; 0

4. (1) $f_x(3,2)<0$ (2) $f_y(2,1)>f_y(2,2)$

5. No; no

6. No; redefine $f(0,0)=0$

7. $f_x = y\,x^{y-1}$; $f_y=\ln(x)\,x^y$; $f_{xx}=y(y-1)\,x^{y-2}$; $f_{yy}=\ln^2(x)\,x^y$;
   $f_{xy}=f_{yx}=x^{y-1}+\ln(x)\,y\,x^{y-1}$

8. $L(x,y,z)=40+60(x-2)+\dfrac{24}{5}(y-3)+\dfrac{32}{5}(z-4)$; 38.96

9. 30π cm^3

10. 1; -2

11. $x+y+z=0$

12. Proof

13. 2π; -2π

14. $-4/5$

15. (1) $\dfrac{1}{\sqrt{5}}\langle 2,1\rangle$; $-\dfrac{1}{\sqrt{5}}\langle 2,1\rangle$ (2) $\dfrac{1}{\sqrt{5}}\langle -1,2\rangle$ or $\dfrac{1}{\sqrt{5}}\langle 1,-2\rangle$

16. (1) $3x+2y+3z=10$ (2) $\dfrac{x-1}{3}=\dfrac{y-2}{2}=\dfrac{z-1}{3}$

17. $(-5/4,-5/4,25/8)$

18. $x=1-4t$, $y=2+2t$, $z=1-2t$

19. $(2,-2,3)$ and $(-2,30,3)$

20. $(0,0)$: local min; $(1/2,-1)$ and $(2,2)$: saddle points

21. $f(0,0)=0$ a local minimum; $(2,0)$ a saddle point

22. (1) max 4 at $(0, \pm 2)$; min -1 at $(1, 0)$

(2) max $2/e$ at $(0, 1)$ and $(0, -1)$; min 0 at $(0, 0)$

(3) max $e^{1/4}$ at $\left(\pm\frac{1}{\sqrt{2}}, \mp\frac{1}{2\sqrt{2}}\right)$; min $e^{-1/4}$ at $\left(\pm\frac{1}{\sqrt{2}}, \pm\frac{1}{2\sqrt{2}}\right)$

23. (1) max 9 and min 1 (2) max 5 and min 1

24. $(\pm 1, 0, 0)$

25. $(8, -2)$

26. False; false; false; false; true