MATH 2443
Final Exam Review Answer Key

1. 1
2. (a) DNE
   (b) 0
   (c) 1
   (d) DNE
3. (a) Saddle point at $(2, -4)$
   (b) Local max at $(0, 2)$
4. Closest points are $(3, 3)$ and $(3, -3)$ and the furthest point is $(-6, 0)$.
5. $\frac{2}{3}$
6. (a) $-\frac{5}{3}$
   (b) $2x - 3y + z = -2$
   (c) 6.3
   (d) $\langle -7, -4 \rangle$
7. $\frac{(27-5\sqrt{5})\pi}{6}$
8. $\frac{40-15\sqrt{3}}{2}$
9. $(-1, 2, 1)$
10. The maximum is 4 at $(8, 4)$ and the minimum is -12 at $(0, 12)$ and $(12, 0)$.
11. (a) $\frac{6}{\sqrt{5}}$
    (b) $\sqrt{20}$
    (c) -2
12. $-\frac{184}{15}$.
13. W_2 is bigger by 2/15
14. (a) 1
    (b) 5
15. $\langle \frac{1}{3}, -\frac{2}{3} \rangle$

16. Max is $64/3$ and min is $-64/3$

17. $\int_{-1}^{1}\int_{0}^{\sqrt{1-y^2}}\sqrt{4z^2+2}\;dzdy$

18. π

19. (a) 6
    (b) $f(x,y) = ye^x + x^3 + 3xy^2 + y^3$
    (c) 1

20. Rectangular: $\displaystyle\int_{-1}^{1}\int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}}\int_{1}^{\sqrt{2-x^2-y^2}} dzdydx$

    Cylindrical: $\displaystyle\int_{0}^{2\pi}\int_{0}^{1}\int_{1}^{\sqrt{1-r^2}} r\;dzdrd\theta$

    Spherical: $\displaystyle\int_{0}^{2\pi}\int_{0}^{\pi/4}\int_{1/\cos(\phi)}^{\sqrt{2}} \rho^2\sin(\phi)\;d\rho d\phi d\theta$

21. $\frac{128\pi}{3}$

22. 0

23. π

24. $\iint_S F\cdot\; d\mathbf{S} = \frac{13}{12}$ and $\iint_S \text{curl}(F)\cdot\; d\mathbf{S} = -\frac{1}{2}$