Chapter 12 Review Exercises

6. $\left\langle \frac{7}{3\sqrt{6}}, \frac{2}{3\sqrt{6}}, -\frac{1}{3\sqrt{6}} \right\rangle$ and $\left\langle -\frac{7}{3\sqrt{6}}, -\frac{2}{3\sqrt{6}}, \frac{1}{3\sqrt{6}} \right\rangle$ **10.** 6 cubic units

16. $x = 1 + 3t$, $y = 2t$, $z = -1 + t$ **18.** $x + 4y - 3z = 6$.

Chapter 13 Review Exercises

8. $L = \frac{2}{27}(13\sqrt{13} - 8)$. **18.** $\mathbf{r}(t) = (t^3 + t)\,\mathbf{i} + (t^4 - t)\,\mathbf{j} + (3t - t^3)\,\mathbf{k}$. **13.3: 6.** $L = 15$

Chapter 14 Review Exercises

16. $w_x = \dfrac{1}{y-z}$, $w_y = -\dfrac{x}{(y-z)^2}$, $w_y = \dfrac{x}{(y-z)^2}$

36. $\dfrac{\partial z}{\partial u} = \cos x - 2uy \sin x - (\sin xy)(x + 2uy)$, $\dfrac{\partial z}{\partial v} = -2v \cos x + (\sin xy)(2vx - y) - y \sin x$

46. $\nabla f(1,2,3) = \left\langle 6, 1, \frac{1}{4} \right\rangle$, $\mathbf{u} = \left\langle \frac{2}{3}, \frac{1}{3}, -\frac{2}{3} \right\rangle$, $D_{\mathbf{u}} f(1,2,3) = \frac{25}{6}$

54. $f(0,-2) = -2/e$ is a local minimum; there are no local maxima or saddle points.

Chapter 15 Review Exercises

14. $\displaystyle\int_0^1 \int_0^{x^2} \frac{ye^{x^2}}{x^3}\, dy\, dx = \frac{1}{4}(e-1)$ **34.** $\dfrac{\pi}{6}$ **42.** $\displaystyle\int_{-\pi/2}^{\pi/2} \int_0^{\pi} \int_0^2 (\rho \sin\phi \sin\theta)^2 \rho \cdot \rho^2 \sin\phi \, d\rho \, d\phi \, d\theta = \frac{64}{9}\pi$

Chapter 16

16.5:

16. $\mathbf{F}$ is conservative because $\operatorname{curl} \mathbf{F} = \mathbf{0}$, $\mathbf{F}$ is defined on all of $\mathbb{R}^3$, and its components have continuous partial derivatives there. $f(x,y,z) = xe^z + y + K$ (K is an arbitrary constant).

18. $\mathbf{F}$ is conservative because $\operatorname{curl} \mathbf{F} = \mathbf{0}$, $\mathbf{F}$ is defined on all of $\mathbb{R}^3$, and its components have continuous partial derivatives there. $f(x,y,z) = \sin(xy) + \cos z + K$ (K is an arbitrary constant).

Review Exercises

6. $e - \dfrac{9}{70}$

12. $\mathbf{F}$ is conservative because $\operatorname{curl} \mathbf{F} = \mathbf{0}$, $\mathbf{F}$ is defined on all of $\mathbb{R}^3$, and its components have continuous partial derivatives there. $f(x,y,z) = x \sin y + \cos z + K$ (K is an arbitrary constant).

14. $f(x,y,z) = xe^y + ye^z$ and $\int_C \mathbf{F} \cdot d\mathbf{r} = f(4,0,3) - f(0,2,0) = 2$ **16.** 3

18. $\operatorname{curl} \mathbf{F} = -e^{-y} \cos z\,\mathbf{i} - e^{-z} \cos x\,\mathbf{j} - e^{-x} \cos y\,\mathbf{k}$ and $\operatorname{div} \mathbf{F} = -e^{-x} \sin y - e^{-y} \sin z - e^{-z} \sin x$