Chapter 30 Even Answers

2. 261 nT into the page.

4. 2.00×10^{-7} T

6. 31.4 cm

8. $\left(1+\frac{1}{\pi}\right)\frac{\mu_0 I}{2R}$ directed into the page.

12. $\frac{\mu_0 I\left(a^2+d^2-d\sqrt{a^2+d^2}\right)}{2\pi a d\sqrt{a^2+d^2}}$ directed away from you

14. (a) 53.3 μT (a) 20.0 μT (c) zero

16. (a) 10.0 μT out of the page (b) 80.0 μN toward the first wire

(c) 16.0 μT into the page (d) 80.0 μN toward the second wire

18. (a) opposite directions (b) 67.8 A

20. 5.40 cm

22. (a) 400 cm (b) 7.50 nT

(c) 1.26 m (d) zero

24. (a) 10.0 μT (b) 2.50 cm

26. 500 A

28. (a) See solution (b) $d = a$

30. (a) 3.98 kA (b) 39.8 kN / m radially outward

32. 226 μN in the plane of the loop and directed away from the center of the loop. Net torque = 0.

34. (a) 7.40 μWb (b) 2.27 μWb

36. (a) 7.19×10^{11} V / m · s (b) 2.00×10^{-7} T

38. (a) 9.27×10^{-24} A · m^2 (b) downward

40. 277 mA

42. 4.80×10^{-9} A · m^2

44. 2.02

46. (a) 12.6 μT (b) 56.0 μT

48. 20.0 μT

50. (a) 30.0 A (b) 88.9 μT, out of the page

52. (a) $B = \mu_0 J_0 R\left[\frac{1}{2}(r/R) - \frac{1}{4}(r/R)^3\right]$ for $r \le R$, $B = \frac{\mu_0 J_0 R}{4(r/R)}$ for $r \ge R$

(b) See solution. (c) At $r = \sqrt{2/3}R$, $B = B_{\max} = 0.272\,\mu_0 J_0 R$

54. 12 layers, 120 m

56. $\frac{\mu_0 q \omega}{2.5\pi R\sqrt{5}}$

58. 1.80 mT

60. (a) See solution. (b) 3.20×10^{-13} T

(c) 1.02×10^{-24} N away from charge #1 (d) 2.30×10^{-22} N away from charge #1

62. 81.7 A

64. 2.97×10^4 K · J / T^2 · m^3

66. $\frac{\mu_0 I_1 I_2 L}{\pi R}$ to the right.

68. 675 A, positive current is downward or negative charge flows upward.

70. (a) $|F_x| = \frac{3\pi}{2}\left(\frac{\mu_0 I^2 R^4}{x^4}\right)$ (b) 5.92×10^{-8} N

74. $\frac{4\pi\omega\rho R^5}{15}$ up