This assignment is in two parts. The answers to questions in Part I are generally in the book. It is advisable to make every effort to solve the problem before consulting the answer. The numbers in parentheses refer to the previous edition of the textbook.

Part I

Section 14.1

1. p.1017, #5, 6 (p.994, #5, 6). Sketch the correct vector field for #6. Confirm this by MAPLE using the commands
   > with(plots): fieldplot([f1,f2], x = a..b, y = c..d);
   over the region shown in the book.

2. (a) p.1017, #41 (p.994, #33)
   (b) p.1018, #84 (p.995, #72). Hint: Substitute the components of curl F into the definition of div .

Section 14.2

3. p.1029, #9 (p.1006, #9)

4. p.1030, #33 (p.1007, #33).

Part II

Section 14.1

5. This problem is to help you derive the gradient in polar coordinates.
   (a) Solve p.883, #61 (a) (p.864, #52 (a)) only.
   (b) Define the unit vectors
       \[ e_r = \frac{r}{r} = \cos \theta i + \sin \theta j, \]
       \[ e_\theta = \frac{de_r}{d\theta} = -\sin \theta i + \cos \theta j. \]
   (c) Use parts (a) and (b) to show that
       \[ \nabla f = \frac{\partial f}{\partial r} e_r + \frac{1}{r} \frac{\partial f}{\partial \theta} e_\theta. \]

6. (a) (MAPLE) p.1091, #11 (p.995, #77).
   (b) Since you know that F in part (a) is conservative, it has a potential function f. Use the results of problem 5 to find f. Method: Write F in polar coordinates. Identify \( \partial f/\partial r \) and \( \partial f/\partial \theta \). Integrate and convert this function back to Cartesian coordinates.

Section 14.2

7. p.1030, #34 (p.1007, #34).

8. p.1030, #42 (p.1007, #40).