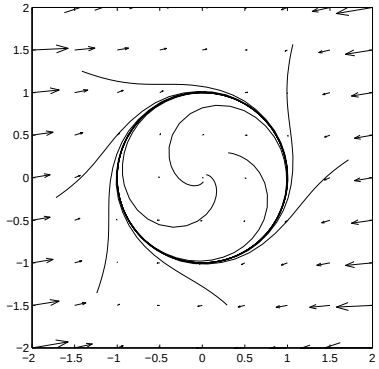
MATLAB Practical II: Solutions

1. Rounding to eight digits, I compute: $\int_0^1 g(x)\,\mathrm{d}x \approx 0.18753817$.

2. The exact solution to $y'(x) = xy$ with $y(0) = 1$ is $y(x) = e^{x^2/2}$.
   At $x = 2$, `ode23` agrees with the exact solution e^2 to two digits after the decimal point (truncating, not rounding); `ode45` agrees to four digits after the decimal point.

3. The parameter `stats` will "Display computational cost statistics".
   Using `options = odeset('reltol', 1e-13, 'abstol', 1e-13);`, I find that `ode45` agrees to ten digits after the decimal point.

4. There appears to be a stable orbit at the unit circle to which the other solutions are attracted.



5. To set the second boundary condition to $y'(1) = 0$, change the second line of `f2bc.m` to read

   ```
   bc = [ya(1)+1; yb(2)];
   ```

   (Note that `yb` is a vector with two components; the first corresponds to $y(b)$, the second to $y'(b)$.)
   The value for $y(\frac{1}{2})$ given by `bvp4c` is $y(\frac{1}{2}) \approx -1.6242$, which agrees with the analytical solution, $y(\frac{1}{2}) = -\cos(\frac{1}{2}) - \tan(1)\sin(\frac{1}{2})$.