1. Determine if each function has a unique fixed point in the given interval.
   (a) $g(x) = 1 - \frac{x^2}{4}$ on $[0, 1]$.
   (b) $g(x) = 2^{-x}$ on $[0, 1]$.
   (c) $g(x) = \frac{1}{x}$ on $[0.5, 5.2]$.

2. Use FPI when $g(x) = -4 + 4x - \frac{x^2}{2}$. Find the actual errors and the actual relative errors for each iterate.
   (a) Find x_1, x_2, x_3 when $x_0 = 1.9$.
   (b) Find x_1, x_2, x_3 when $x_0 = 3.8$.
   (c) Use the FPI theorem to make conclude what will happen in these FPI sequences.

3. Use FPI when $g(x) = 0.5x + 1.5$. Find the actual errors and the actual relative errors for each iterate.
   (a) Find x_1, x_2, x_3, x_4, x_5 when $x_0 = 4$.
   (b) Find the fixed point (exactly) with your bare hands.
   (c) Can FPI be used to find a fixed point of $g(x) = x^2 + x - 4$. Explain.

4. Make cobweb (staircase) diagrams for each of the following.
   (a) $g(x) = \sqrt{6 + x}, x_0 = 7$.
   (b) $g(x) = 1 + \frac{2}{x}, x_0 = 4$.
   (c) $g(x) = \frac{x^2}{3}, x_0 = 3.5$.
   (d) $g(x) = -x^2 + 2x + 2, x_0 = 2.5$.

5. $f(x) = x \sin x$ has a root x^* between $a = 2$ and $b = 4$ because it is continuous and
   (a) Use the Bisection Method for f, a and b to find x_8.
   (b) Use the Bisection error formula to find an error bound for your approximate root x_8.
   (c) How many steps of Bisection are necessary to get 11 digits of accuracy after the decimal place?

6. Let $f(x) = e^x - x - 2$.
   (a) Find a and b so that $f(a) \cdot f(b) < 0$.
   (b) Use the Bisection Method for f, a and b to find x_8.
   (c) Use the Bisection error formula to find an error bound for your approximate root x_{18}.
   (d) How many steps of Bisection are necessary to get 9 digits of accuracy after the decimal place?

7. (a) Use Newton's method to find the approximation x_3 to $x^* = \sqrt{5}$ when $x_0 = 2$. Give your answer with 12 decimal places of accuracy. Explain how you used Newton's.
   (b) Use the Secant Method to find the approximate roots x_2, x_3, and x_4 to $f(x) = x^3 - 3x + 2$ when $x_0 = -2.6$ and $x_1 = -2.4$. Give your answers with four places of accuracy after the decimal.

8. (a) Use Newton's method to find the approximation x_{11} to a root of $f(x) = x^3 - 3x - 2$ when $x_0 = 2$. Give your answer with 10 decimal places of accuracy.
   (b) Repeat the above problem with different initial approximations $x_0 = -3, -2, -1, 0, 1$, and then 3. Make a rough sketch of $f(x) = x^3 - 3x - 2$ to explain the different convergence speeds.

9. TEXTBOOK EXERCISES: 1, 3, 5, 6, 15.