

## Appendix G

## Newton's Method

1.  $f(x) = \ln x + x$ ,  $f'(x) = \frac{1}{x} + 1$ , if  $x_0 = \frac{1}{2}$  (other first guesses are possible) then

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} \approx .5 - \frac{-1931471806}{3} \approx .5643823935$$

$$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)} \approx .5643823935 - \frac{-0076408611}{2.771848328} \approx .5671389877$$

$$x_3 = x_2 - \frac{f(x_2)}{f'(x_2)} \approx .5671389877 - \frac{-0000118894}{2.763236211} \approx .5671432904$$

The last two agree to three decimal places, so we can stop.

3.  $f(x) = e^x - x - 3$ ,  $f'(x) = e^x - 1$ , if  $x_0 = -3$  (other first guesses are possible) then

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} \approx -3 - \frac{04978706837}{-95021293163} \approx -2.947604304$$

$$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)} \approx -2.947604304 - \frac{000069550}{-9475347537} \approx -2.947530903$$

The last two agree to three decimal places, so we can stop.

8.  $f(x) = x^3 - 3x^2 + 2$ ,  $f'(x) = 3x^2 - 6x$ , if  $x_0 = 3$  (other first guesses are possible) then

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} = 3 - \frac{2}{9} \approx 2.777777778$$

$$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)} \approx 2.777777778 - \frac{28532236}{6.48148148} \approx 2.733756614$$

$$x_3 = x_2 - \frac{f(x_2)}{f'(x_2)} \approx 2.733756614 - \frac{01024996}{6.01773600} \approx 2.732053322$$

$$x_4 = x_3 - \frac{f(x_3)}{f'(x_3)} \approx 2.732053322 - \frac{00001509}{6.00002613} \approx 2.732050807$$

The last two agree to three decimal places, so we can stop.

9.  $f(x) = \sin x - x^2$ ,  $f'(x) = \cos x - 2x$ , if  $x_0 = 1$  (other first guesses are possible) then

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} \approx 1 - \frac{-15852901519}{-1.4596976941} \approx .8913959953$$

$$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)} \approx .8913959953 - \frac{-0166371741}{-1.154465366} \approx .8769848448$$

$$x_3 = x_2 - \frac{f(x_2)}{f'(x_2)} \approx .8769848448 - \frac{-0002881492}{-1.114497548} \approx .8767262985$$

$$x_4 = x_3 - \frac{f(x_3)}{f'(x_3)} \approx .8767262985 - \frac{-0000000926}{-1.113781703} \approx .8767262154$$

The last two agree to four decimal places, so we can stop.