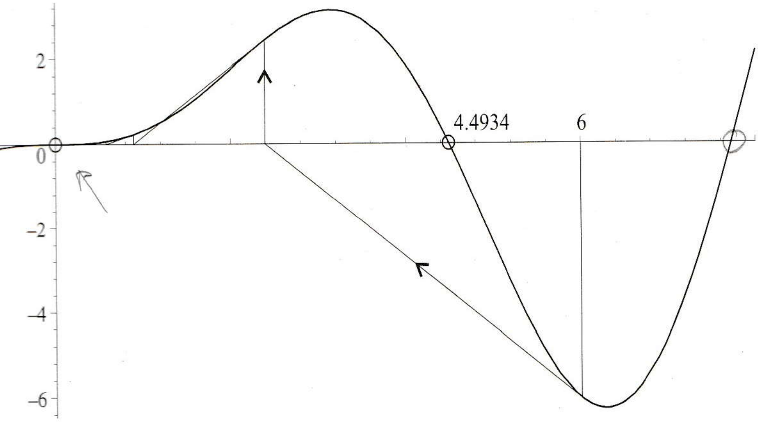
6



.10: *For initial approximation $x_0 = 6$, Newton's method converges
ot $r = 0$.*

termine how we got this. *Hint:* First show that

$$\int \ln(1+x)\,dx = (1+x)\,\ln(1+1) - x.$$

re Peter Stone

en expand the integrand in a Maclaurin series. In addition, choose one (or
re, if you wish) of the following alternating series to study as in Example
. Determine the exact sum of the series by methods as suggested in the
ove hint.

) The alternating series

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{2n-1} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots,$$

is a famous alternating series. Use the code in Example 3.3 to compute the partial sums s_k of this series until k is the first value for which $a_{k+1} \le \varepsilon$, with $\varepsilon = .001$. What is the value of $k = k_0$ for which this occurs? Can you predict this value k_0 in advance? Produce a table of the last 100 values of the partial sums s_k, $k = k_0 - 100, \ldots, k_0$, with five values per line. Does this series converge very slowly? Why? Show that the series converges to $\pi/4$,

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{2n-1} = \frac{\pi}{4}.$$

Hint: Use a method like that in the preceding exercise, but now with

$$\int \frac{1}{1+x^2}\,dx = \tan^{-1}(x).$$