1.1.16. Let $f(x) = e^{x/2}\sin(x/3)$. Use Maple to determine the following.

a. The third Maclaurin polynomial $P_3(x)$.

b. $f^{(4)}(x)$ and a bound for the error $|f(x) - P_3(x)|$ on $[0, 1]$.

1.2.4. Perform the following computations (i) exactly, (ii) using three-digit chopping arithmetic, and (iii) using three-digit rounding arithmetic. (iv) Compute the relative errors in parts (ii) and (iii).

a. $\frac{4}{5} + \frac{1}{3}$

b. $\frac{4}{5} \cdot \frac{1}{3}$

c. $\left(\frac{1}{3} - \frac{3}{11}\right) + \frac{3}{20}$

d. $\left(\frac{1}{3} + \frac{3}{11}\right) - \frac{3}{20}$

1.2.9. The first three nonzero terms of the Maclaurin series for the arctangent function are $x - (1/3)x^3 + (1/5)x^5$. Compute the absolute error and relative error in the following approximations of π using the polynomial in place of the arctangent:

a. $4\left[\arctan\left(\frac{1}{2}\right) + \arctan\left(\frac{1}{3}\right)\right]$

b. $16\arctan\left(\frac{1}{5}\right) - 4\arctan\left(\frac{1}{239}\right)$

1.3.2. The number e is defined by $e = \sum_{n=0}^{\infty}(1/n!)$. Use four-digit chopping arithmetic to compute the following approximations to e, and determine the absolute and relative errors.

a. $e \approx \sum_{n=0}^{5} \frac{1}{n!}$

b. $e \approx \sum_{j=0}^{5} \frac{1}{(5-j)!}$

c. $e \approx \sum_{n=0}^{10} \frac{1}{n!}$

d. $e \approx \sum_{j=0}^{10} \frac{1}{(10-j)!}$

1.3.7. Find the rates of convergence of the following functions as $h \to 0$.

a. $\lim_{h\to 0} \frac{\sin h}{h} = 1$

b. $\lim_{h\to 0} \frac{1 - \cos h}{h} = 0$

c. $\lim_{h\to 0} \frac{\sin h - h\cos h}{h} = 0$

d. $\lim_{h\to 0} \frac{1 - e^h}{h} = -1$