Approximations using only a few terms of the MacLaurin Series

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \frac{x^5}{5!} + \dots$$

$$e = 1 + 1 + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} + \frac{1}{5!} + \frac{1}{6!} + \frac{1}{7!} + \frac{1}{8!} + \frac{1}{9!} + \frac{1}{(10)!} + \frac{1}{(11)!} + \frac{1}{(12)!} + \dots$$

$$e = 2.71828182845904523536028747135\dots$$

$$e \approx 1 + 1 = 2$$

$$e \approx 1 + 1 + \frac{1}{2!} = 2.5$$

$$e \approx 1 + 1 + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} = 2.708333\dots$$

$$e \approx 1 + 1 + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} + \frac{1}{5!} + \frac{1}{6!} + \frac{1}{7!} + \frac{1}{8!} + \frac{1}{9!} + \frac{1}{(10)!} = 2.7182818011\dots$$

$$e \approx 1+1+\frac{1}{2!}+\frac{1}{3!}+\frac{1}{4!}+\frac{1}{5!}+\frac{1}{6!}+\frac{1}{7!}+\frac{1}{8!}+\frac{1}{9!}+\frac{1}{(10)!}+\dots+\frac{1}{(19)!}+\frac{1}{(20)!} = 2.71828182845904523533978449\dots$$

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \frac{x^5}{5!} + \dots$$

$$e^{\frac{1}{2}} = 1 + \frac{1}{2} + \frac{\left(\frac{1}{2}\right)^2}{2!} + \frac{\left(\frac{1}{2}\right)^3}{3!} + \frac{\left(\frac{1}{2}\right)^4}{4!} + \dots$$

$$\sqrt{e} = 1.648721270700128146\dots$$

$$e^{\frac{1}{2}} \approx 1 + \frac{1}{2} = 1.5$$

$$e^{\frac{1}{2}} \approx 1 + \frac{1}{2} + \frac{\left(\frac{1}{2}\right)^2}{2!} = 1.625$$

$$e^{\frac{1}{2}} \approx 1 + \frac{1}{2} + \frac{\left(\frac{1}{2}\right)^2}{2!} + \frac{\left(\frac{1}{2}\right)^3}{3!} = 1.645833\overline{3}$$

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \frac{x^9}{9!} + \dots$$

$$\sin 1 = 1 - \frac{1}{3!} + \frac{1}{5!} - \frac{1}{7!} + \frac{1}{9!} + \dots$$

$$\sin 1 = 0.841570984807\dots$$

$\sin 1 \approx 1$

$\sin 1 \approx 1 - \dfrac{1}{3!} = \dfrac{5}{6} = 0.8\overline{333}$ with error at most $\dfrac{1}{5!} = \dfrac{1}{120} = 0.008\overline{33}$ by ASET

$\sin 1 \approx 1 - \dfrac{1}{3!} + \dfrac{1}{5!} = \dfrac{101}{120} = 0.841\overline{666}$ with error at most $\dfrac{1}{7!} = \dfrac{1}{5040} = 0.00019841269\dots$ by ASET

$\sin 1 \approx 1 - \dfrac{1}{3!} + \dfrac{1}{5!} - \dfrac{1}{7!} = \dfrac{4241}{5040} = 0.84146825\dots$ with error at most $\dfrac{1}{9!} = \dfrac{1}{362880} = 0.0000027557\dots$ by ASET

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \frac{x^9}{9!} + \dots$$

$$\sin 0.16 = 0.16 - \frac{(0.16)^3}{3!} + \frac{(0.16)^5}{5!} - \frac{(0.16)^7}{7!} + \frac{(0.16)^9}{9!} + \dots$$

$$\sin 0.16 = 0.15931820661424596331 1463\dots$$

$\sin 0.16 \approx 0.16$

$\sin 0.16 \approx 0.16 - \frac{(0.16)^3}{3!} = 0.15931733\dots$ with error at most $\frac{(0.16)^5}{5!} = 0.000000873\dots$ by ASET

$\sin 0.16 \approx 0.16 - \frac{(0.16)^3}{3!} + \frac{(0.16)^5}{5!} = 0.1593182071466\dots$

with error at most $\frac{(0.16)^7}{7!} \approx 5.326 * 10^{-10}$ by ASET