

$$29. e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}, \text{ so } e^{-0.2} = \sum_{n=0}^{\infty} \frac{(-0.2)^n}{n!} = 1 - 0.2 + \frac{1}{2!}(0.2)^2 - \frac{1}{3!}(0.2)^3 + \frac{1}{4!}(0.2)^4 - \frac{1}{5!}(0.2)^5 + \frac{1}{6!}(0.2)^6 - \dots$$

But $\frac{1}{6!}(0.2)^6 = 8.\bar{8} \times 10^{-8}$, so by the Alternating Series Estimation Theorem, $e^{-0.2} \approx \sum_{n=0}^5 \frac{(-0.2)^n}{n!} \approx 0.81873$,

correct to five decimal places.

$$30. 3^\circ = \frac{\pi}{60} \text{ radians and } \sin x = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{(2n+1)!}, \text{ so}$$

$$\sin \frac{\pi}{60} = \frac{\pi}{60} - \frac{\left(\frac{\pi}{60}\right)^3}{3!} + \frac{\left(\frac{\pi}{60}\right)^5}{5!} - \dots = \frac{\pi}{60} - \frac{\pi^3}{1,296,000} + \frac{\pi^5}{93,312,000,000} - \dots$$

But $\frac{\pi^5}{93,312,000,000} < 10^{-8}$, so by the Alternating Series Estimation Theorem,

$$\sin \frac{\pi}{60} \approx \frac{\pi}{60} - \frac{\pi^3}{1,296,000} \approx 0.05234.$$