

$$\begin{aligned}
f(x) &= f(0) + xf'(0) + \frac{1}{2}x^2f''(0) + \frac{1}{3!}x^3f'''(0) + \dots \\
(a+x)^\gamma &= a^\gamma + \gamma x a^{\gamma-1} + \frac{1}{2}\gamma(\gamma-1)x^2 a^{\gamma-2} + \frac{1}{3!}\gamma(\gamma-1)(\gamma-2)x^3 a^{\gamma-3} + \dots \\
\frac{1}{1+x} &= 1 - x + x^2 - x^3 + \dots \\
\frac{1}{(1+x)^2} &= 1 - 2x + 3x^2 - 4x^3 + \dots \\
\sqrt{1+x} &= 1 + \frac{1}{2}x - \frac{1}{8}x^2 + \frac{1}{16}x^3 + \dots \\
\frac{1}{\sqrt{1+x}} &= 1 - \frac{1}{2}x + \frac{3}{8}x^2 - \frac{5}{16}x^3 + \dots \\
e^x &= 1 + x + \frac{1}{2}x^2 + \frac{1}{3!}x^3 + \dots \\
\sin(x) &= x - \frac{1}{3!}x^3 + \frac{1}{5!}x^5 - \dots \\
\cos(x) &= 1 - \frac{1}{2}x^2 + \frac{1}{4!}x^4 + \dots \\
\sin(a+x) &= \sin(a) + x \cos(a) - \frac{1}{2}x^2 \sin(a) - \frac{1}{6}x^3 \cos(a) + \dots \\
\cos(a+x) &= \cos(a) - x \sin(a) - \frac{1}{2}x^2 \cos(a) + \frac{1}{6}x^3 \sin(a) + \dots \\
\ln(1+x) &= x - \frac{1}{2}x^2 + \frac{1}{3}x^3 + \dots \\
\ln(a+x) &= \ln(a) + \ln(1+x/a) = \ln(a) + \frac{x}{a} - \frac{1}{2}\left(\frac{x}{a}\right)^2 + \frac{1}{3}\left(\frac{x}{a}\right)^3 + \dots
\end{aligned}$$

Table 2.1: Taylor series expansions, about  $x = 0$ , for some of the more commonly used functions.

M. H. Holmes, *Introduction to the Foundations of Applied Mathematics (2nd Ed)*,  
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