Formula Sheet

Quadratic Formula

$$ax^2 + bx + c = 0 \text{ when } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Taylor Polynomial

$$P_n(x) = \sum_{k=0}^{n} \frac{f^{(k)}(c)}{k!}(x - c)^k$$

Taylor's Remainder Formula

$$f(x) - P_n(x) = \frac{f^{(n+1)}(z)}{(n+1)!}(x - c)^{n+1} \text{ for some } z \text{ between } x \text{ \& } c$$

Important Maclaurin Series

Function	Maclaurin Series	Radius of Convergence
e^x	$\sum_{k=0}^{\infty} \frac{x^k}{k!}$	$R = \infty$
$\sin x$	$\sum_{k=0}^{\infty} \frac{(-1)^k x^{2k+1}}{(2k+1)!}$	$R = \infty$
$\cos x$	$\sum_{k=0}^{\infty} \frac{(-1)^k x^{2k}}{(2k)!}$	$R = \infty$
$\frac{1}{1-x}$	$\sum_{k=0}^{\infty} x^k$	$R = 1$

Newton's Method

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

Secant Method

$$x_{n+1} = x_n - \frac{f(x_n)(x_n - x_{n-1})}{f(x_n) - f(x_{n-1})}$$

Newton's Method for Systems

$$\mathbf{x}_{n+1} = \mathbf{x}_n - \mathbf{J}(\mathbf{x}_n)^{-1}\mathbf{F}(\mathbf{x}_n)$$

Condition Number

$$\kappa(A) = \|A\| \, \|A^{-1}\|$$