Lesson Twelve: The `cases` and `array` Environments

Definition. We define the *absolute value function* $|x|$ as follows.

$$|x| = \begin{cases} -x, & \text{if } x < 0 \\ x, & \text{if } x \geq 0 \end{cases}$$

Notation. We denote the *identity matrix* as I_n. See below.

$$I_n = \begin{pmatrix} 1 & 0 & \cdots & 0 & 0 \\ 0 & 1 & \cdots & 0 & 0 \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ 0 & 0 & \cdots & 1 & 0 \\ 0 & 0 & \cdots & 0 & 1 \end{pmatrix}$$

Exercise Twelve: The `cases` and `array` Environments

In a linear algebra course, we learn that the determinant of a 2×2 matrix is computed in the following way.

$$\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$$

Here's an interesting function. It's continuous *only* at $x = 0$.

$$f(x) = \begin{cases} x, & \text{if } x \in \mathbb{Q} \\ -x, & \text{if } x \in \mathbb{R} - \mathbb{Q} \end{cases}$$

And here's a function whose mixed partials (f_{xy} and f_{yx}) are not equal at $(0,0)$.

$$f(x,y) = \begin{cases} \frac{xy^3 - yx^3}{x^2 + y^2}, & \text{if } (x,y) \neq (0,0) \\ 0, & \text{if } (x,y) = (0,0) \end{cases}$$