0. Fill-in-the boxes. Below, $a, b, c \in \mathbb{R}$ with $a < c < b$.

0.1. If $f\colon [0,\infty) \to \mathbb{R}$ is continuous, then we define the improper integral $\int_0^\infty f(x)\,dx$ by

$$\int_0^\infty f(x)\,dx = \boxed{}\,.$$

0.2. If $f\colon (-\infty,0] \to \mathbb{R}$ is continuous, then we define the improper integral $\int_{-\infty}^0 f(x)\,dx$ by

$$\int_{-\infty}^0 f(x)\,dx = \boxed{}\,.$$

0.3. If $f\colon (-\infty,\infty) \to \mathbb{R}$ is continuous, then we define the improper integral $\int_{-\infty}^\infty f(x)\,dx$ by

$$\int_{-\infty}^\infty f(x)\,dx = \boxed{}\,.$$

0.4. If $f\colon (a,b] \to \mathbb{R}$ is continuous, then we define the improper integral $\int_a^b f(x)\,dx$ by

$$\int_a^b f(x)\,dx = \boxed{}\,.$$

0.5. If $f\colon [a,b) \to \mathbb{R}$ is continuous, then we define the improper integral $\int_a^b f(x)\,dx$ by

$$\int_a^b f(x)\,dx = \boxed{}\,.$$

0.6. If $f\colon [a,c) \cup (c,b] \to \mathbb{R}$ is continuous, then we define the improper integral $\int_a^b f(x)\,dx$ by

$$\int_a^b f(x)\,dx = \boxed{}\,.$$

0.7. An improper integral as above *converges* precisely when

$$\boxed{}$$

0.8. An improper integral as above *diverges* precisely when

$$\boxed{}$$