Don't Tread On Me - Solution

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Solution: Each of the four panels contributes one letter to make up the final answer. The top-left panel contains portraits of four mathematicians: Galois, Gauss, Germain and Gödel. The obvious common thread being the letter **G**. The top-right panel is a little number theory puzzle whose solution is $50(= 5^2 + 5^2 = 7^2 + 1^2)$, which to the Roman Remus and Romulus would be **L**. The bottom-left panel asks for the area underneath the graph of $y = e^x$ and above the interval $(-\infty, 1]$, which is given by $\int_{-\infty}^{1} e^x \, dx = \mathbf{e}$.

Finally, the bottom-right panel, which is perhaps the most cryptic, indicates non-associativity. The last entry of the answer key at the bottom is a further clue: $\| \div \|$. This is the norm of the division symbol, or a normed division. A tenuous leap from here gets us to normed division algebras, of which the most famous non-associative one is the octonions, or $\mathbb{O}$. You can now use the answer key to put the letters in order.

Final answer: LeG$\mathbb{O}$, or Lego. The puzzle title should resonate with anyone who's ever stepped on one of these.

Author's notes: This was my first attempt at writing a puzzle of this kind. The original version was red-herring central, but more horrifically it relied on *sports trivia*. This was switched out to the number theory problem in the current version (top-right panel), which I was assured was a more reasonable ask. The story in this panel is an homage to the famous Hardy–Ramanujan taxicab anecdote.

The puzzle title was intended to be a hint, since getting $\mathbb{O}$ from the bottom-right panel was deemed to be too much of a stretch. But perhaps this was unnecessary, since once you have G, L, E, you're not left with many choices for the last letter. (Legs? Gels?) To increase the overall difficulty and make guessing a less viable strategy, an alternative top-left panel that was considered for a quick second was:

$$?(1) = ?(2)$$
$$?\left(\tfrac{1}{2}\right) = \sqrt{\pi}$$

Do you see how to get G from this? (You didn't expect homework when you started reading this, did you?)