Graph \( y = x^x \) is both base and exponent variable so can be rewritten as an exponential
\[
\log(y) = x \log(x) \Rightarrow y = e^{x \log(x)}
\]

\( x > 0 \) since base of an exponent expression should be positive to avoid problems.

1st derivative info \( \frac{dy}{dx} = \frac{d}{dx} e^{x \log(x)} = e^{x \log(x)} \left( \frac{d}{dx} (x \log(x)) \right) = x^x (1 + \log(x)) \Rightarrow \) \( x = e^{\log(x)} = e^{0} = 1 \) \( \Rightarrow \log(y) = \log(e^0) = 0 \Rightarrow y = 1 \)

2nd derivative info \( \frac{d^2 y}{dx^2} = \frac{d}{dx} \left[ e^{x \log(x)} (1 + \log(x)) \right] = e^{x \log(x)} \left( \frac{d}{dx} (1 + \log(x)) \right) = e^{x \log(x)} \left( 1 + \log(x) + \frac{1}{x} \right) \Rightarrow \) \( y = e^{x \log(x)} (1 + \log(x) + \frac{1}{x}) \)

Limits at edge of domain:
\[
\lim_{x \to 0^+} x^x = 0 \text{ indeterminate by } 0^0 \text{ form as } 0 \cdot \infty \text{ product}
\]
\[
\lim_{x \to 0^+} x^x \sim 0 \cdot \infty \text{ indeterminate quotient, L'Hôpital's Rule applies}
\]

\[
\lim_{x \to 0^+} \frac{\log(x)}{x} = \lim_{x \to 0^+} \frac{\frac{d}{dx} (\log(x))}{\frac{d}{dx}(x)} = \lim_{x \to 0^+} \frac{\frac{1}{x}}{1} = \lim_{x \to 0^+} \frac{1}{x} = 0
\]

Since \( \log(x) \) is increasing, \( x \log(x) \) crosses thru zero, \( \Rightarrow \) \( \frac{d}{dx} \left( \frac{1}{y} \right) = e^{x \log(x)} \left( 1 + \log(x) + \frac{1}{x} \right) \)

\[
\lim_{y \to 0^+} \frac{1}{y} = \lim_{x \to 0^+} \frac{1}{x} = 0
\]

Similarly, \( 0^0 \text{ and } \infty^0 \) are other types of symbolic indeterminate limits that can be handled this way.