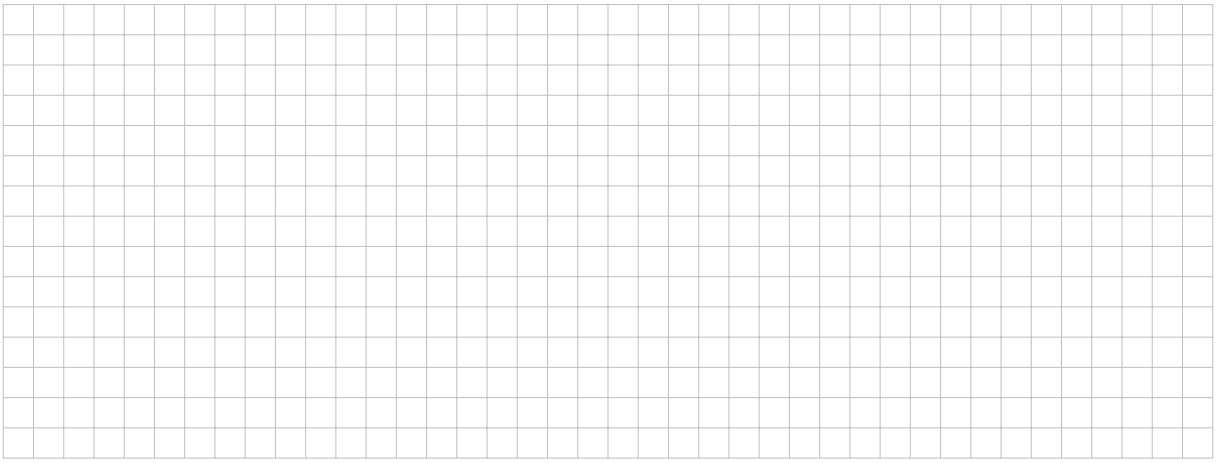
1. Integration is at the heart of probability and statistics. One distribution commonly used in economics applications is the Pareto distribution, which has a distribution function $F(x) = \int_1^x \frac{\alpha}{t^{\alpha+1}}\, dt$, where α is a constant greater than 1 and $x \geq 1$.

a) Find a formula for $F(x)$ that does not involve an integral.

b) Calculate $\lim_{x\to\infty} F(x)$.

b) The mean of the Pareto distribution is $\lim_{x\to\infty} \left[\int_1^x \frac{\alpha}{t^{\alpha}}\, dt\right]$. Find this value.

2. Let $g(x) = \int_0^x t \sin t \, dt$. Use your curve sketching skills to draw a graph of $y = t \sin t$ for $-2\pi \leq t \leq 2\pi$ and use the graph to help answer the following questions.



a) Is $g(\pi)$ greater than 0 or less than 0?

b) Is $g(-\pi)$ greater than 0 or less than 0?

c) Is $g(2\pi)$ greater than 0 or less than 0?

d) Find the local extremes of g over the interval $[-2\pi, 2\pi]$ and determine if each is a minimum or maximum.