

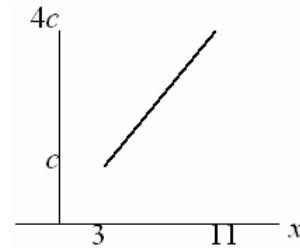
BE SURE TO SHOW ALL WORK AND USE PROPER NOTATION.

1. Use the graph to answer the following.

A. Determine if the graph is a density function or a cumulative distribution function, then find  $c$ .

B. Write a piecewise formula for this function.

C. Find the median and mean.



2. Determine if the function is a density function or a cumulative distribution function, explain. Include a sketch of the graph.

$$y = \begin{cases} 0 & x < -1 \\ \frac{x^3 + 1}{9} & -1 \leq x < 2 \\ 1 & x \geq 2 \end{cases}$$

3. The shelf life, in days, for bottles of a certain prescribed medicine has the density function

$$p(x) = \begin{cases} \frac{20000}{(x+100)^3} & x > 0 \\ 0 & \text{elsewhere} \end{cases}$$

A. Find the probability that a bottle of this medicine will have a shelf life of at least 200 days. Include an illustration.

B. Write a piecewise formula for the cumulative distribution function.

4. A coffee machine is regulated so that it dispenses an average of 200 milliliters per cup. If the amount of coffee has a normal density with a standard deviation of 15 milliliters, answer the following.

A. Use calculus I techniques to prove that the inflection points occur one standard deviation on either side of the mean. Use this to sketch an accurate graph of the density function.

B. Estimate the percentage of cups that will contain between 190 and 210 milliliters of coffee.

C. If the Styrofoam cups themselves only hold 240 milliliters, what percentage of the cups will overflow?