

Math 221 Quiz #8 Solutions

1. Let $P(t)$ denote the world population in year t . Give a careful and precise description of the meaning of the derivative $P'(t)$. What are the units of $P'(t)$? If $P'(t_0) > 0$ what can you say about the world population in year t_0 ?

Answer: $P'(t)$ gives the rate of change of the world population with respect to time in year t . Its units are people/year. If $P'(t_0) > 0$ then the population is **increasing** in year t_0 .

2. Let $y = f(x) = \sqrt{x}$. Use the definition of the derivative to calculate the value of $f'(4)$.

Answer: From the definition, we calculate

$$f'(4) = \lim_{x \rightarrow 4} \frac{f(x) - f(4)}{x - 4} = \lim_{x \rightarrow 4} \frac{\sqrt{x} - 2}{x - 4} = \lim_{x \rightarrow 4} \frac{(\sqrt{x} - 2)(\sqrt{x} + 2)}{(x - 4)(\sqrt{x} + 2)} = \lim_{x \rightarrow 4} \frac{1}{\sqrt{x} + 2} = \frac{1}{4}.$$