



ICE - Interpreting Derivatives

Controversial entrepreneur Arnold “Mad Dog” Johnson plans to make a fortune selling T-shirts in the town of Ann Arbor, Michigan. (See Figure 1.) It costs Mr. Johnson \$3 to make each T-shirt. A little market research indicates that Mr. Johnson will probably sell $480 - x^2$ T-shirts each month if he charges \$ x for each T-shirt.



Figure 1.

- ***Find a function that gives the cost that Mr. Johnson incurs when he sells the T-shirts at a price of \$ x .***

- ***Using the limit definition, find an equation for the derivative of Mr. Johnson's cost function.***

- ***Use the equation for the derivative to complete the following sentence:***

If Mr. Johnson increased his prices from \$7 for a T-shirt to \$8 for a T-shirt, his costs would rise by approximately \$_____ .

• **Find a function that gives the revenue that Mr. Johnson collects when he sells the T-shirts at a price of \$ x . (Assume that Mr. Johnson manages to sell every T-shirt that he produces, up to the limit of $480 - x^2$.)**

• **Using the limit definition (or any other rules for differentiation that you know) find an equation for the derivative of Mr. Johnson's revenue function.**

• **Use the equation for the derivative to complete the following sentence:**

If Mr. Johnson increased his prices from \$7 for a T-shirt to \$8 for a T-shirt, his revenues would rise by approximately \$_____.

- ***When will Mr. Johnson's profit be the greatest? Explain your reasoning in terms of the economic considerations that Mr. Johnson should bear in mind.***

- ***Calculate the price that Mr. Johnson should use.***