

Worksheet: Applying the Fundamental Theorem

All Questions should be done without using *fnInt* on your calculator unless otherwise indicated.

Question 1

One of the earliest pollution problems brought to the attention of the Environmental Protection Agency (EPA) was the case of the Sioux Lake in eastern South Dakota. For years a small paper plant located nearby had been discharging waste containing carbon tetra-chloride into the waters of the lake. At the time EPA learned of the situation, the chemical was entering at a rate of 16 cubic yards per year. The agency immediately ordered the installation of filters designed to slow (and eventually stop) the flow of the chemical from the mill. Implementation of this program took exactly three years, during which the flow of pollutant was steady at 16 cubic yards/year. Once the filters were installed, the flow declined. From the time the filters were installed until the time the flow stopped, the rate of flow was well approximated by : $F'(t) = t^2 - 14t + 49$ where t is measured in year since the EPA learned of the situation.

- Draw a graph showing the rate of the flow of carbon tetra-chloride into the lake as a function of time, beginning at the time the EPA first learned of the situation.
- How many years elapsed between the time the EPA learned of the situation and the time the pollution flow stopped entirely?
- How much carbon tetra-chloride entered the waters during the time shown in the graph in part (a)?

Question 2

Suppose that when a hockey player strikes a puck with a certain force, the puck moves along the ice with velocity $v(t) = 64 - \sqrt{t}$ ft/sec at time t , for the first 8 seconds. Determine the distance between the puck and the player after 5 seconds.

Question 3

The value of a certain piece of real estate in Halifax has been increasing at a rate of $\sqrt{36 + t}$ thousand dollars per year since 1997. If its value in 1998 was \$250 000, predict its value in 2008.

Question 4

Suppose that a company that is just beginning experiences a rate of growth in its profit that varies a great deal. [This is not unusual for a new company]. Its growth rate in thousands of dollars per month can

be represented by; $s'(t) = -\frac{1}{2}t \sin(2t) + \frac{1}{4}t - 3$

where t is the number of months since the company was first formed. Determine the total gain or loss during the first year this company is in operation.

[Use your calculator to evaluate]

