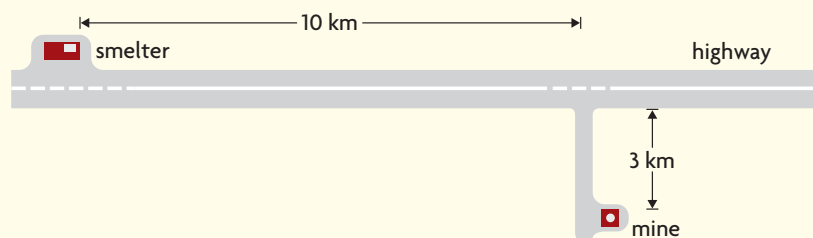


CHAPTER 3: MAXIMIZING PROFITS

A construction company has been offered a contract for \$7.8 million to construct and operate a trucking route for five years to transport ore from a mine site to a smelter. The smelter is located on a major highway, and the mine is 3 km into a heavily forested area off the road.



Construction (capital) costs are estimated as follows:

- Repaving the highway will cost \$200 000/km.
- A new gravel road from the mine to the highway will cost \$500 000/km.

Operating conditions are as follows:

- There will be 100 round trips each day, for 300 days a year, for each of the five years the mine will be open.
- Operating costs on the gravel road will be \$65/h, and the speed limit will be 40 km/h.
- Operating costs on the highway will be \$50/h, and the speed limit will be 70 km/h.

Use calculus to determine if the company should accept the contract. Determine the average speeds of the trucks along the paved and gravel roads that produce optimum conditions (maximum profit). What is the maximum profit?

Key Concepts Review

In Chapter 3, you have considered a variety of applications of derivatives on an interval.

You should now be familiar with the following concepts:

- the position, velocity, and acceleration functions $s(t)$, $v(t)$, and $a(t)$, respectively, where $v(t) = s'(t)$ and $a(t) = v'(t) = s''(t)$
- the algorithm for finding absolute maximum and absolute minimum values
- derivatives that involve cost, revenue, and profit in the social sciences
- optimization problems (remember that you must first create a function to analyze, and that restrictions in the domain may be crucial)