SMALLGROUP WORKSHEET:
APPLIED MATHEMATICS
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SECTION 4.5 — BASIC ECONOMICS

1. An online seller of knitted sweaters finds that it costs $35 to make her first sweater. Her cost for each additional sweater goes down until it reaches $25 for her 100th sweater, and after that it starts to rise again. If she can sell each sweater for $35, is the quantity sold that maximizes her profit less than 100 or greater than 100?

2. The total cost $C(q)$ of producing $q$ goods is modeled by the formula
$C(q) = 0.01q^3 - 0.6q^2 + 13q$ dollars.
(a) What is the fixed cost?
(b) What is the maximum profit if each item is sold for $7?
(c) Suppose exactly 34 goods are produced. They all sell when the price is $7 each, but for each $1 increase in price, 2 fewer goods are sold. Should the price be raised, and if so by how much?

SECTION 4.6 — RELATED RATES

3. The area $A$ of a square is increasing at 3 cm$^2$ per minute. How fast is the sidelength of the square changing exactly when $A = 576$ cm$^2$?

4. The radius of a spherical balloon is increasing by 2 cm/sec. At what rate is the air being blown into the balloon when the radius is 10 cm?

5. A cone-shaped coffee filter of radius 6 cm and depth 10 cm contains water. It drips out through a hole at the bottom at a constant rate of 1.5 cm$^3$ per second. How fast is the water level falling at depth 8 cm?

6. A train is traveling at 0.8 km/min along a long straight track. It is moving away from a movie camera, which is focused on it and stands 0.5 km away from the track. How fast is the camera rotating (in radians/minute) at the moment when the train is 1 km from the camera?

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