INTERMEDIATE ALGEBRA — concluded

6 a For what values of \( m \) will the roots of the equation
\[ x^2 - (m - 3) x + 2m - 9 = 0 \]
be equal? \([6\frac{1}{2}]\)

b Determine the nature of the roots of
\[ 25x^2 + 75x - k = 0 \]
when \( k \) is a positive number. \([6]\)

7 The arms of a right triangle are 5 feet and \( x \) feet.

a Express the hypotenuse, the perimeter and the area in terms of \( x \). \([3]\)

b If the number of linear feet in the perimeter equals the number of square feet in the area, find the numerical
value of \( x \). \([3\frac{1}{2}, 6]\)

8 A man bought a lot for \$280; he then sold it for \$60 an acre, thereby gaining as much as \( 3\frac{1}{2} \) acres of the lot had cost him. How many acres were there in the lot? \([7\frac{1}{2}, 5]\)

9 A man saves \$a\) the first year and increases by \$d\) each year the amount saved the preceding year.

a How much will he save \( n \)th year? \([2\frac{1}{2}]\)

b Using the proper formula, find how many years it will take him to save \$4500 if \$a = \$100 and \$d = \$50. \([10]\)

10 a By substitution in the proper formula find the expression for the sum of the first 10 terms of the progression
1, 1.05, (1.05)^2, . . . \([6\frac{1}{2}]\)

b Using logarithms, find the value of the expression
\[ \frac{(1.04)^{11}}{0.46} \]

11 a If \( x \) is a positive number, determine without solving whether each of the following statements is true or false: \([Copy each statement and after it write the word true or false, giving a reason in each case.\]

\[ \frac{50}{x^2 + 7} = -4; \quad \sqrt{2x + 1} = -1; \quad \frac{200}{x^2 + 5} = \frac{200}{x} \]

b Given \( y = mx + c \); if \( y = -1 \) when \( x = 1 \), and \( y = 5 \) when \( x = 4 \), find the values of \( m \) and \( c \). \([6\frac{1}{2}]\)

12 The dimensions of a rectangle are 5 and 3. The longer dimension is decreased by \( x \) and the shorter dimension is increased by \( x \); the area of the new figure is represented by \( y \).

a Express \( y \) in terms of \( x \). \([3]\)

b Graph the relation between \( y \) and \( x \) for integral values of \( x \) from \(-3 \) to \( 5 \) inclusive. \([6\frac{1}{2}]\)

c From the graph determine \( x \) and \( y \) when the area is the largest possible. \([3]\)