SKILLS Objective A

In 1 and 2, consider the polynomial function p with $p(x) = -2x^3 + 8x^2 - 9x + 3$.

1. Estimate the zeros of p to the nearest tenth. $x = 0.6, 1.0, 2.4$

2. Estimate to the nearest thousandth the relative extrema of p. $(0.806, -0.104)$ $(1.860, 1.067)$

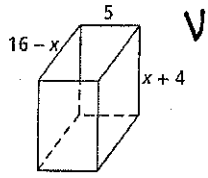
PROPERTIES Objective F

3. For the polynomial function P with $P(x) = 7x + 3x^3 - 4 - x^4$, identify
   a. the degree of the polynomial. 4
   b. the coefficient of x. 7
   c. the leading coefficient. -1
   d. the constant term. -4

USES Objective I

$V(x) = 5(16 - x)(x + 4)$

4. a. Express the volume V of a box with sides as shown at the right as a polynomial function in terms of x.



$V(x) = -5x^2 + 60x + 320$

   b. Find the maximum volume of the box. 500 un^3

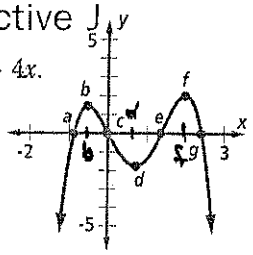
$(-\frac{b}{2a}, f(-\frac{b}{2a}))$

5. Sally saved some of her summer salary each year to help pay for college. She had the same savings factor $1 + x$ each year. A polynomial for her savings is $S(x) = 550x^5 + 780x^4 + 1300x^2 + 1525x + 1500$.
   a. What amount did Sally save her second summer? \$780
   b. Which summer did Sally spend all her salary? her 3rd summer
   c. Evaluate $S(1.0225)$ and explain what it means. \$5,885.80

The sum of Sally's summer savings at 2.25% interest

REPRESENTATIONS Objective J

6. Consider the graph of $f(x) = -\frac{11}{8}x^4 + 4x^3 - 4x$. Use the letter labels.



   a. In what interval(s) is f negative? $x < 9$, $c < x < e$, $x > 9$
   b. In what interval(s) is f increasing? $x < b$, $d < x < f$

SKILLS Objective B

In 1–2, determine if y is a polynomial function of x of degree less than 5. If so, find an equation of least degree for y in terms of x.

1.

x	1	2	3	4	5	6	7	8
y	−5	19	99	295	691	1395	2539	4279

yes! $y = x^4 + 3x^2 - 9$

2.

x	1	2	3	4	5	6	7
y	8	17	36	75	154	313	632

no :(

3. The following are the first six triangular numbers t_n.
$t_1 = 1, t_2 = 3, t_3 = 6, t_4 = 10, t_5 = 15, t_6 = 21$

   a. Determine a polynomial formula for t_n.

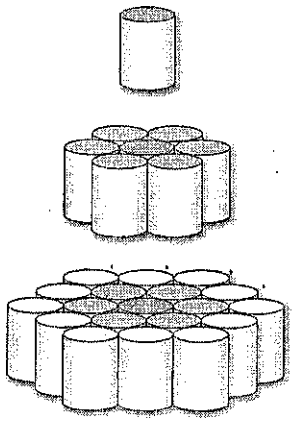
   $t_n = \frac{1}{2}n^2 + \frac{1}{2}n$

   b. Calculate t_{100}.

   5050

USES Objective I

4. Consider a soup can display in which every pattern after the first is arranged in a pattern of concentric hexagons, as shown at the right. the first layer has 1 can, the second layer has 7 cans, the third layer has 19 cans, and so on.



1	1
2	7
3	19
4	37

   a. Give a polynomial expression for the number c_n of cans in layer n.

   $c_n = 3n^2 - 3n + 1$

   b. Give a polynomial expression for the total number t_n of cans in a display having n layers.

   $t_n = n^3$

	total
1	1
2	8
3	27

Questions on SPUR Objectives
See Student Edition pages 496–499 for objectives.

VOCABULARY

1. Give the definition of *polynomial*.

Expression of form $a_n x^n + a_{n-1} x^{n-1} \ldots + a_1 x + a_0$, n is non-negative integer w/ $a_n \neq 0$

2. State the Remainder Theorem.

If a polynomial $p(x)$ is divided by $x-c$ (linear divisor), then remainder is $f(c)$

SKILLS Objective C

3. If a polynomial $p(x)$ is divided by x, what is the remainder?

$p(0)$

4. Suppose $p(x) = d(x) \cdot q(x) + r(x)$, $p(x) = 2x^2 + 6x - 8$, and $d(x) = x + 3$. Find possible polynomials $q(x)$ and $r(x)$.

divisor · quotient + remainder

$2x - 8$

In 5–8, determine the quotient and remainder when the first polynomial is divided by the second.

5. $x^3 - 13x^2 + 48x - 27, x - 3$

$x^2 - 10x + 18 + \frac{27}{x-3}$

6. $y^6 - 7y^4 - 70, y - 5$

$y^5 + 5y^4 + 18y^3 + 90y^2 + 450y + 2250 + \frac{11,180}{y-5}$

7. $z^4 - z^3 - 5z^2 + 4z + 16, 2z^2 + 4$

$\frac{1}{2}z^2 - \frac{1}{2}z - \frac{7}{2} + \frac{6z+30}{2z^2+4}$

8. $2a^6 + 5a^4 - 19a^3 + 22a - 50, a^3 + 2$

$2a^3 + 5a - 23 + \frac{12a - 4}{a^3+2}$

In 9–12, use the Remainder Theorem to find the remainder when the first polynomial is divided by the second.

9. $t^5 - t^4 + t^3 - t^2 + t - 1, t + 1$

$p(-1) = -6$

10. $r^5 - r^4 + r^3 - r^2 - r - 1, r - 1$

$p(1) = -2$

11. $2w^6 + 2w^5 + 2w^4 + 2w^3 + 2w^2 + 2w + 2, w - \frac{1}{2}$

$p(\frac{1}{2}) = \frac{127}{32}$

12. $3y^4 + 5y^2 - 1, y - \sqrt{2}$

$p(\sqrt{2}) = 21$