

1. 15 pts. Construct a polynomial function of degree 6 having zeros 3 (with multiplicity 2),  $-4$  (with multiplicity 1), and 1 (with multiplicity 3), and whose graph contains the point  $(-1, 20)$ . Do not bother to expand the product.
2. 15 pts. Construct a polynomial function of degree 3 having real coefficients and zeros 6 and  $1 - 2i$ . Expand the product to write the polynomial in standard form.
3. 15 pts. Let  $G(x) = 2x^4 + 11x^3 - 5x^2 - 43x + 35$ . Use the Rational Zeros Theorem to find all the real zeros of  $G$ , then use the zeros to factor  $G(x)$  over the real numbers.

4. 10 pts. Find all solutions to the equation

$$x^3 - 8x^2 + 25x - 26 = 0.$$

5. 10 pts. Given that  $3i$  is a zero of

$$H(x) = 3x^4 + 5x^3 + 25x^2 + 45x - 18,$$

find the remaining zeros of  $H$ .

6. 15 pts. Find all asymptotes for the rational function

$$Z(x) = \frac{x^3 - 8}{x^2 - 5x + 6}.$$

7. 10 pts. each Solve each inequality algebraically, writing the solution set in interval notation.

(a)  $x^4 > 16$

(b)  $x^3 - 2x^2 - 3x < 0$ .

(c)  $\frac{3x - 5}{x + 2} \geq 2$

8. 10 pts. For  $f(x) = x^2 - 5$  and  $g(x) = 7/x$  evaluate  $(f \circ g)(4)$ ,  $(g \circ f)(2)$ ,  $(f \circ f)(1)$ , and  $(g \circ g)(-2)$ .

9. 10 pts. each Let

$$f(x) = \sqrt{6 - 3x} \quad \text{and} \quad g(x) = -\frac{1}{4x}.$$

(a) Find  $f \circ g$ , and state its domain.

(b) Find  $g \circ f$ , and state its domain.

(c) Find  $g \circ g$ , and state its domain.