

1. 10 pts. Expand $(2x - 1)^5$ using the Binomial Theorem.
2. 10 pts. Construct a polynomial function of degree 4 having zeros -2 (with multiplicity 1), 0 (with multiplicity 2), and 4 (with multiplicity 1).
3. 15 pts. Let $f(x) = x^4 - x^3 - 6x^2 + 4x + 8$. Use the Rational Zeros Theorem to find all the real zeros of f , then use the zeros to factor f over the real numbers.
4. 10 pts. Solve the equation in the real number system:

$$2x^3 - 11x^2 + 10x + 8 = 0.$$

5. 10 pts. The complex number $1 + 3i$ is a zero of

$$f(x) = x^4 - 7x^3 + 14x^2 - 38x - 60.$$

Find the remaining zeros of f .

6. 5 pts. each For the rational function

$$T(x) = \frac{x^2 + 6x + 5}{2x^2 + 7x + 5}$$

do the following.

- (a) Find the domain of T .
 - (b) Find the intercepts of T .
 - (c) Find all vertical asymptotes of T , if any.
 - (d) Find the horizontal or oblique asymptote of T , if any.
7. 10 pts. each Solve each inequality algebraically.
 - (a) $x^3 - 2x^2 - 3x > 0$.
 - (b) $\frac{x + 6}{2x - 1} \geq -1$
 8. 10 pts. For $f(x) = \sqrt{x + 1}$ and $g(x) = 3x$ find $(f \circ g)(4)$, $(g \circ f)(2)$, $(f \circ f)(1)$, and $(g \circ g)(0)$.

9. 10 pts. each Let

$$f(x) = x^2 - 2 \quad \text{and} \quad g(x) = \sqrt{x + 3}.$$

- (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.

10. 10 pts. each Find the inverse of each function.

(a) $f(x) = x^3 - 3$

(b) $g(x) = \frac{x^2 - 1}{3x^2}, \quad x > 0$