

1. 10 pts. Expand $(2x + 3)^5$ using the Binomial Theorem.
2. 10 pts. Form a polynomial function of degree 4 having zeros $-4, -1, 2, 3$.
3. 2.5 pts. each Let $f(x) = 4(x + 4)(x + 3)^3$.
 - (a) List each real zero of f and its multiplicity.
 - (b) Determine whether the graph of f crosses or touches the x -axis at each x -intercept.
 - (c) Determine the maximum number of turning points on the graph of f .
 - (d) Determine the end behavior of the graph of f .
4. 15 pts. Let $f(x) = 2x^4 - x^3 - 5x^2 + 2x + 2$. Use the Rational Zeros Theorem to find all the real zeros of f , then use the zeros to factor f over the real numbers.
5. 10 pts. Solve the equation in the real number system:

$$x^3 + \frac{3}{2}x^2 + 3x - 2 = 0.$$

6. 10 pts. The number $3 - 2i$ is a zero of

$$f(x) = x^4 - 9x^3 + 21x^2 + 21x - 130.$$

Find the remaining zeros of f .

7. 5 pts. each For the rational function

$$Q(x) = \frac{x^2}{x^2 + x - 6}$$

do the following.

- (a) Find the domain of Q .
- (b) Find the intercepts of Q .
- (c) Find all vertical asymptotes of Q .
- (d) Find the horizontal or oblique asymptote of Q .
- (e) Find all points where Q intersects its horizontal or oblique asymptote.
- (f) Sketch the graph of Q , finding additional points as needed.

8. 10 pts. each Solve each inequality algebraically.

(a) $3x^3 < -15x^2$.

(b) $\frac{(x-2)^2}{x^2-1} \geq 0$

9. 10 pts. Find the domain of the function

$$f(x) = \sqrt{\frac{x-2}{x+4}}.$$

10. 10 pts. each Let

$$f(x) = \sqrt{x-2} \quad \text{and} \quad g(x) = 1 - 2x.$$

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

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

11. 10 pts. each Find the inverse of each function.

(a) $f(x) = x^2 + 25, x \leq 0$.

(b) $g(x) = \frac{3x+2}{2x-9}$