

1. 10 pts. Given that  $3i$  is a zero of  $f(x) = 3x^4 + 5x^3 + 25x^2 + 45x - 18$ , find all remaining zeros of  $f$ .
2. 10 pts. Find the complex zeros of  $g(x) = 4x^3 + 4x^2 - 7x + 2$ , and write  $g(x)$  in factored form.
3. 10 pts. Find  $k$  such that  $h(x) = x^4 - kx^3 + kx^2 + 1$  has the factor  $x + 2$ .
4. 10 pts. Find all asymptotes of the rational function

$$J(x) = \frac{8x^2 + 26x - 7}{4x + 1}.$$

5. 10 pts. each Solve each inequality algebraically, giving the solution set in interval notation.
  - (a)  $x^3 + x^2 < 4x + 4$
  - (b)  $\frac{x - 3}{x + 1} > 0$
  - (c)  $\frac{2x - 6}{1 - x} \leq 2$

6. 10 pts. each Let

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

- (a) Evaluate  $(g \circ g)(-2)$  and  $(f \circ f)(82)$ .
  - (b) Find  $f \circ g$ , and state its domain in interval notation.
  - (c) Find  $g \circ f$ , and state its domain in interval notation.
  - (d) Find  $f \circ f$ , and state its domain in interval notation.
7. 10 pts. If  $f(x) = 3x^2 - 7$  and  $g(x) = 2x + c$ , find the value of  $c$  so that the graph of  $f \circ g$  crosses the  $y$ -axis at 68.

8. 10 pts. Let

$$F(x) = \frac{2x - 3}{x + 4},$$

which is one-to-one.

- (a) Find the inverse function  $F^{-1}$ .
- (b) Find the domain and range of  $F$  and  $F^{-1}$ .