

This test has pages 1 – 5. Take a moment to make sure you have them all.

No Calculators Allowed; No Reference Materials; Just You and Your Pencil and Eraser.

- 1 Feel-good warm-up problem: Make a rough graph of $f(x) = 2x^2 - 6x$. Label the salient points (vertices, intercepts, asymptotes) of your graph directly with their coordinates. Really check this out: subsequent problems depend on your correct answer to this one.

- 2 Use your answer from problem 1 to give, in interval notation, the domain of

$$Q(x) = \sqrt{2x^2 - 6x} \text{ is } \underline{\hspace{2cm}}.$$

- 3 Make a rough graph of the polynomial $P(x) = (2x^2 - 6x)(x^2 - 4x + 4)$. Label the salient points of your graph directly with their coordinates.

- 4 Make a rough graph of the rational function $f(x) = \frac{-5x + 5}{x - 3}$. Label the salient features of your graph directly with their coordinates or equations.

- 5 Show steps in factoring the polynomial $P(x) = x^5 + 6x^3 - 2x^2 - 27x - 18$. Be sure to write down the factorization at the end of your work. Be sure to work with the missing x^4 term! I'm so worried you'll ignore this situation and thus wander unproductively.

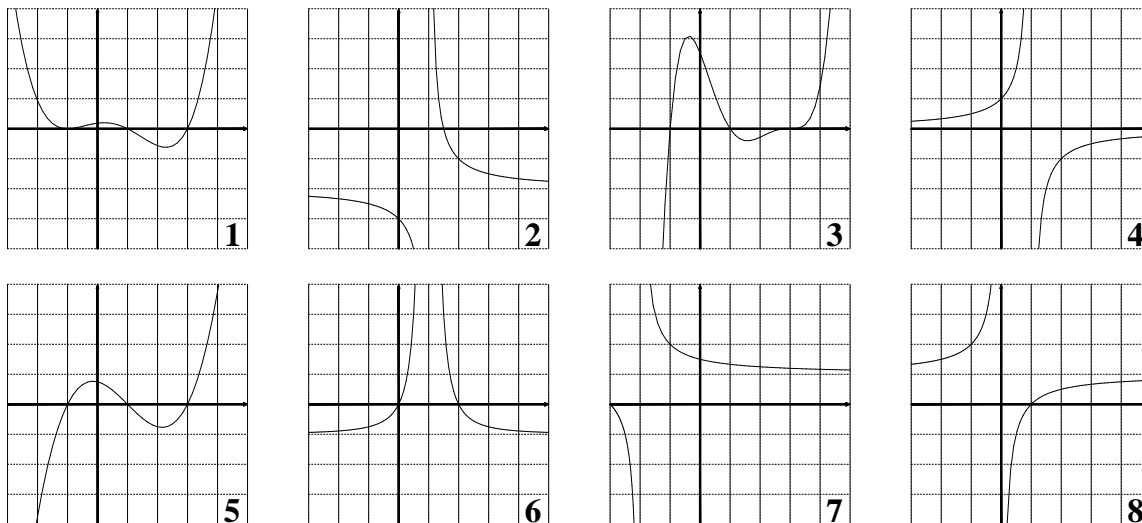
6 Let $\mathbf{a} = 3 - 5i$ and $\mathbf{b} = 4 + 3i$.

(a) Compute the value of $\frac{\mathbf{a}}{\mathbf{b}}$, in standard complex-number form.

(b) Expand and simplify: $(x - \mathbf{a})(x - \bar{\mathbf{a}})$

7 Consider the function Q given by $Q(x) = \sqrt{3x + 4}$. Either find a formula for the function Q^{-1} or explain why Q^{-1} is undefined.

8 The numbered graphs show parts of graphs of various functions. Fill each blank with the graph number best corresponding to the function. The coordinate lines are one unit apart.



(a) _____ $y = \frac{(x - 1)(x + 1)(x - 3)}{4}$

(e) _____ $y = -\frac{2x - 3}{x - 1}$

(b) _____ $y = \frac{(x - 1)(x + 1)^2(x - 3)}{16}$

(f) _____ $y = -1 + \frac{1}{(x - 1)^2}$

(c) _____ $y = \frac{3(x - 1)(x + 1)(x - 3)^3}{32}$

(g) _____ $f(x) = 1 - \frac{1}{x}$

(d) _____ $y = \frac{x + 3}{x + 2}$

(h) _____ $g(x) = -\frac{1}{x - 1}$

9 Explain whether parts (g) and (h) in problem 8 are inverses of one another.