This is NOT A SAMPLE TEST, but a study aid. These problems are representative of the material covered thus far; they may or may not be similar to midterm problems. For more problems, I would direct you to the problems in chapter 1 – 3 of our textbook.

(1) Solve:

(a) \((x + 1)^2 - 7 = 9\).
(b) \((x - 7)^2 + x = 19\).
(c) \((3x - 7)(4x - 5) + x = 5\).
(d) \(x^4 + 9 = 10x^2\).
(e) \(\frac{x^2}{16} + \frac{x}{4} = 2\).
(f) \(\frac{1}{x + 5} + \frac{2}{x - 5} = \frac{20}{x^2 - 25}\).
(g) \(\frac{2}{3x} + \frac{7}{1 - x} = \frac{1}{x - 1}\).
(h) \(\frac{x}{2x + 3} + \frac{x + 1}{4x^2 - 9} = \frac{5}{x + 5}\).
(i) \(\sqrt{x + 3} - x = -3\).
(j) \(|5x - 2| = 8\).
(k) \[ 1 + |1 - 3x| \leq 11. \]
(l) \[ -2|x + 7| > 10. \]
(m) \[ 5x^2 - 7x > 6. \]
(n) \[ \frac{1}{2x - 5} > 1. \]
(o) \[ \frac{x}{x - 2} \leq \frac{2}{1 - x}. \]
(p) \[ \frac{x}{22x + 4} > 21. \]
(q) \[ x^3 + 15x \leq 8x^2. \]
(2) Simplify:

(a) \[ \frac{5}{x} + \frac{x-2}{x+2} - \frac{1}{x} - \frac{x}{x+2} \cdot \]

(b) \[ \frac{3}{x^2 + 7x - 78} + \frac{x}{x-6} - \frac{2x+1}{x+13} \cdot \]

(3) Jack is an avid runner. He runs up a steep mountain trail 4 miles long and then returns on the same trail. Uphill he goes one mile per hour faster than half his downhill rate. If the round trip time is one hour and forty minutes, then what is Jack’s downhill rate?

(4) A coolant reservoir contains 9 liters of a 20 percent antifreeze solution. How many liters of the antifreeze must be drained and replaced with pure water in order to achieve a 15 percent antifreeze solution?

(5) Find the vertex form for \( f(x) = 2x^2 + 16x + 11 \).

(6) Find the vertex form for a quadratic function whose graph has a vertex at \((3, -2)\) and passes through \((1, 6)\).

(7) Divide by using either synthetic or long division:
(a) \( (4x^4 - 13x^3 + 5x - 8) \div (x^2 + 1) \).

(b) \( (5x^3 + 8x^2 - 61x + 11) \div (x - 3) \).

(8) Find the domain and all roots of the function:
\[ f(x) = \frac{x^3 - 3x^2 - 4x + 12}{x^2 - 1} \cdot \]
(9) Find the slope-intercept form of the equation of the line that passes through (7, 2) and perpendicular to $14x - 2y = 1$.

(10) Find an equation of the perpendicular bisector of the segment with endpoints at (1, 2) and (7, 6).

(11) Let $f(x) = \sqrt{4 - x^2} + 2$ and $g(x) = 4 - \frac{1}{x}$. Find the domains of both $f(x)$ and $g(x)$. Determine whether $f(x)$ is even, odd, or neither. Do the same for $g(x)$.

Describe $f(x)$ as a reflection followed by horizontal and vertical shifts.

Evaluate $(f \circ g)(x)$.

(12) Assume that student performance on an exam is directly proportional to study time. If a student can score 70 points on an exam with 5 hours of study, what score would the student get with 7 hours of study?

(13) Suppose a rocket travels along a path $y = \frac{-1}{10}x^2 + 2x + 6$ where $y$ is height in miles and $x$ is horizontal distance in miles. Find the maximum height of the rocket.

(14) Let $f(x) = |x - 1|$. Is $f(x)$ even, odd or neither?

(15) Explain how to get the graph of $-f(x - 5) + 2$ from the graph of $f(x)$.

(16) Let $f(x) = -3(x - 4)^2(x - 6)(x + 1)^3$. What is the degree of $f(x)$? What are the $x$-intercepts of the graph of $f(x)$? What are the multiplicities of each of the roots of $f(x)$ and how do they relate to the geometry of the $x$-intercepts? What is the end behavior of $f(x)$?

(17) Find a function $f(x)$ that has zeros at $1 + i$ and 2 that tends to $-\infty$ as $x$ goes to either $\pm \infty$.

(18) Factor completely: $f(x) = 5x^3 - 21x^2 + 16$.

(19) Factor completely: $f(x) = x^4 + 2x^3 - 4x^2 - 5x - 6$.

(20) More?? - REDO ALL QUIZZES and 'YOU TRY' PROBLEMS.