
Name:

Instructions:

- Attempt all questions.
- The test is out of 100 marks.
- There are 10 questions, 10 marks each.
- You have 60 minutes to complete the test.
- You may use calculators on this test.

Advice:

- Budget your time.
 - Do questions which you know how to do immediately first.
 - Leave questions which you find difficult until last.
 - Ask for clarification if you do not understand a question.
 - You must show your work. Label sketches well.
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Problem 1. (10 marks) For the quadratic function $f(x) = 14x^2 - 3x + 4$, convert to the vertex form $f(x) = a(x - h)^2 + k$ by completing the square. Identify the vertex and axis of symmetry for this quadratic function. You must use completing the square in this problem.

Problem 2. (10 marks) Find the remainder $r(x)$ when $g(x) = -4x^3 - 2x + 3$ is divided by $d(x) = x - 8$ using long division of polynomials.

Problem 3. (10 marks) Describe, using proper limit notation, the end behaviour of the rational function

$$g(x) = \frac{-3x^3 + 24x - 78}{2x^3 - 99}$$

Problem 4. (10 marks) Identify all possible rational factors of the polynomial $f(x) = 12x^5 - 8x^3 + 10x - 4$. Explain how you would determine which numbers from your list are actually going to be a factor (you don't have to find the actual factors, just explain the process).

Problem 5. (10 marks) Sketch the polynomial $f(x) = (x - 1)^3(x + 2)^2$ by hand. Show all your work.

Problem 6. (10 marks) Sketch the rational function $h(x) = \frac{(2x - 12)^3}{x^2}$ by hand (find x -intercepts, vertical asymptotes, and end behaviour).

Problem 7. (10 marks) Solve the inequality $\frac{(3x + 5)|x - 2|}{x - 5} < 0$.

Problem 8. (10 marks) Solve the inequality $\frac{1}{x + 1} + \frac{1}{x - 3} \leq 0$.

Problem 9. (10 marks) The power P in watts produced by a windmill is proportional to the cube of the wind speed v in mph. If a wind of 10 mph generates 15 watts of power, how much power is generated by winds of 20, 40 and 80 mph?

Problem 10. (10 marks) Find the x -intercepts and their multiplicity for the polynomial
 $f(x) = x^3 - x^2 - x + 1$.