

Name: _____
Student ID: _____

Test 1

This test is graded out of 49 marks. No books, notes, graphing calculators or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

Question 1.(4 marks) Simplify, expressing the answers with positive exponents only:

a. (4 marks)

$$\left[\frac{-2x^2y^{-1}}{(-3x^{-2}y^4)^2} \right]^{-3}$$

b. (4 marks)

$$\sqrt[3]{\frac{-27x^2y^{-2}z^0}{\sqrt{64z^6y^4}}}$$

Question 2. Expand and simplify:

a. (2 marks)

$$x^3(2x-3)^2$$

b. (2 marks)

$$(x-1)^3$$

c. (2 marks)

$$(2\sqrt{3}-3\sqrt{5})(4\sqrt{5}+\sqrt{7})$$

Question 3. (4 marks) Divide by long division.

$$\frac{2x^3+5x^2-1}{x-2}$$

Question 4. Factor completely:

a. (1 mark)

$$x^2 - 9x + 20$$

b. (1 mark)

$$9x^2 - 16$$

c. (2 marks)

$$8x^2 + 14x + 5$$

d. (2 marks)

$$15x^4 - 25x^3 + 10x^2$$

Question 5. Simplify the rational expressions:

a. (5 marks)

$$\frac{a^2 - ax}{3ax - 2x^2} \times \frac{4ax + 2x^2}{ax - x^2} \div \frac{4a^2 + 2ax}{9a - 6x}$$

b. (5 marks)

$$\frac{2 - 5x}{x + 3} - \frac{3 + x}{3 - x} + \frac{2x(2x - 11)}{x^2 - 9}$$

Question 6. (5 marks) Simplify the complex fractions:

$$\frac{\frac{2}{1-x^2}}{\frac{1}{1-x} - \frac{1}{1+x}}$$

Question 7. Rationalize the denominator and simplify:

a. (1 mark)

$$\frac{2}{\sqrt{5}}$$

b. (2 marks)

$$\frac{7}{1 + \sqrt{7}}$$

Question 7. (3 marks) Find the number such that 7 less than 4 times itself is 13.

Question 8. (4 marks) Solve for x :

$$(x^2 - 25)(3x^2 + 4x - 6) = 0$$

Bonus.

- a. (2 marks) The *rational root theorem* states that if the polynomial $p(x) = x^n + a_{n-1}x^{n-1} + \cdots + a_1x + a_0$ has coefficients a_i that are all integers and $p(x)$ has a rational root r , then a_0 is divisible by r . Let $p(x) = x^3 + 4x^2 + x - 6$ then state the possible rational roots.
- b. (2 marks) The *factor theorem* states that if $p(r) = 0$ then $(x - r)$ is a factor of $p(x)$. Using the rational root theorem find all factors of $p(x)$.
- c. (1 mark) Factor $p(x)$.