MATH 108 Readiness Check

This review targets those aspects of Grade 10 and 11 algebra that are particularly important for doing calculations in Math 108 (Applied Calculus). For most students, the following exercises will be relatively easy. However, if you have not done a Mathematics course recently, you may find these problems challenging. If you feel overwhelmed by the difficulty of these questions, you may want to consider taking a preparatory course such as Math 107, before attempting Math 108. Math 107 is University transferable and is eligible for student loans. If after trying these questions you are unclear regarding the best decision for you, talk to your instructor.

Section 1 – Expanding and Simplifying

Use proper order of operations to expand and simplify the following expressions:

1. $6 - 4(1 - 3x) + 2x(x - 6)$
2. $(3x + 3h - 2)^2 - (3x - 2)^2$
3. $(x - 5)^3$

Section 2 – Factoring.

Use any appropriate factoring technique to factor completely:

1. $5x^3 - 25x^2 + 30x$
2. $2x^2 + 5x - 12$
3. $x^3 - 4x^2 - 9x + 36$

Factor out the greatest common factor and simplify:

4. $8x(2x^2 - 5)^3 + 48x^3(2x^2 - 5)^2$

Section 3 – Rational Expressions

1. For what values of x is the expression $\frac{x+2}{x^3-4x}$ not defined?
2. Simplify: $\frac{x^2+3x-18}{x-3}$
3. Simplify: $\frac{8x(4x-1)^2-32x^2(4x-1)}{(4x-1)^4}$ Hint: factor the top to start.
4. Simplify: $\frac{\frac{1}{2x+2h+7}-\frac{1}{2x+7}}{h}$

Section 4 – Solving Equations

1. Solve the linear equation: $\frac{2}{3} - \frac{3}{2}x = 4 + 2(3x - 5)$
2. Solve the following polynomial equations:

   a) $(x - 3)(x + 6) = 10$

   b) $3x^2 - 8x + 2 = 0$ (Use the Quadratic Formula)

   c) $4x^3 - 12x^2 - 9x + 27 = 0$ (Hint: factor)

3. Solve the following rational equations:

a) $\dfrac{x^2-25}{x^2-10x+25} = 0$ b) $\dfrac{x}{4x+3} - \dfrac{1}{x+2} = 0$ c) $\dfrac{2}{x} + \dfrac{1}{2} = \dfrac{11}{12}$

4. Solve the following radical equations:

a) $\sqrt{7x+1} - 8 = 0$

b) $\sqrt{2x^2 - 4x - 21} - x = 0$

Section 5 – Solving Inequalities

1. Solve the linear inequality: $9 - 4(2x - 3) \geq 3(5 - 2x)$

2. Solve the following inequalities by simplifying to make one side zero (if needed), finding all values for which the expression is zero or undefined and then using test points on a number line. Give your answers using interval notation.

a) $x^2 - 8x + 14 < 2$

b) $(4 - x)(x - 1)^2(x + 2)^3 > 0$

c) $\dfrac{x^2+2x-3}{x-5} \geq 0$

d) $\dfrac{2x-1}{x+2} \leq 1$

Section 6 – Exponents and Radicals

1. Convert the following radical expressions to ones involving rational exponents:

a) $2\sqrt[4]{x^3} + 6\sqrt{x^8}$ b) $\sqrt{(2x^2 + 1)^3}$

2. Convert the following expressions involving rational exponents to radicals:

a) $x^{\frac{3}{4}}$ b) $(x^2 + y^2)^{\frac{1}{2}}$

3. Use your calculator to estimate $(-9)^{\frac{4}{3}}$

4. Convert $(4^{-1} + 3^{-1})^{-2}$ to a fraction.

5. Simplify the following expression and give your answer with only positive exponents:

$$\frac{x^{-2}(3x^{-1})^{-4}}{x^{-4}}$$

6. Factor out the greatest common factor and simplify the following expression:

$$6x^2(4x + 1)^{\frac{3}{2}} + 12x^3(4x + 1)^{\frac{1}{2}}$$

7. Rationalize the **denominator** in the following expression: $\dfrac{3}{\sqrt{x} - \sqrt{3}}$

8. Rationalize the **numerator** and simplify the following expression: $\dfrac{\sqrt{2x} - \sqrt{10}}{x-5}$

Answers

Section 1:

1. $2x^2 + 2$
2. $9h^2 + 18xh - 12h$
3. $x^3 - 15x^2 + 75x - 125$

Section 2:

1. $5x(x-2)(x-3)$
2. $(2x-3)(x+4)$
3. $(x-3)(x+3)(x-4)$
4. $8x(2x^2-5)^2(8x^2-5)$

Section 3:

1. $x = 0, 2, -2$
2. $x + 6, x \neq 3$
3. $\dfrac{-8x}{(4x-1)^3}$
4. $\dfrac{-2}{(2x+2h+7)(2x+7)}, h \neq 0$

Section 4:

1. $x = \dfrac{8}{9}$

2. a) $x = 4, -7$ b) $x = 2.39,\ 0.28$ c) $x = 3, \dfrac{3}{2}, -\dfrac{3}{2}$

3. a) $x = -5$ b) $x = 3, -1$ c) $x = \dfrac{24}{5}$

4. a) $x = 9$ b) $x = 7$

Section 5:

1. $x \leq 3$

2. a) $(2, 6)$ b) $(-2, 1) \cup (1, 4)$

   c) $[-3, 1] \cup (5, \infty)$ d) $(-2, 3]$

Section 6:

1. a) $2x^{\frac{3}{4}} + 6x^4$ b) $(2x^2 + 1)^{\frac{3}{2}}$

2. a) $\sqrt[4]{x^3}$ b) $\sqrt{x^2 + y^2}$

3. 18.7208 4. $\dfrac{144}{49}$ 5. $\dfrac{x^6}{81}$ 6. $6x^2(6x+1)(4x+1)^{\frac{1}{2}}$

7. $\dfrac{3(\sqrt{x}+\sqrt{3})}{x-3}$ 8. $\dfrac{2}{\sqrt{2x}+\sqrt{10}}, x \neq 5$