Name: _____ Date: _____ Period: _____

Review for Unit 4: Polynomials Exam

Logistics of the Exam – The exam will be 20 questions. There will be two sections: Section A will include 10 multiple choice questions worth 40 points. Section B will include 10 free response questions worth 60 points. The multiple-choice questions will have 4 to 5 answer choices. The free response questions will be a mix of error analysis, modelling, and short answer. You will have 80 minutes to complete the entire exam and you may **not** have more time.

Resources and Tools Allowed on the Exam – pencil, highlighter, Unit 4 formulas (given in the box below) and a graphic display calculator.

Axis of Symmetry for Quadratic Functions	**Solutions of a Quadratic Equation**
$f(x) = ax^2 + bx + c \Rightarrow x = \frac{-b}{2a}$	$ax^2 + bx + c = 0 \Rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Content of the Exam – Students will be expected to:

- Consider a quadratic model and what the characteristics of that quadratic represents in context. [MC]
- Find the quadratic regression for a set of data points. [FR]
- Convert between the forms of a quadratic function. [MC]
- Simplify radicals with negative radicands. [FR]
- Evaluate and simplify expressions involving powers of i. [FR]
- Add or subtract complex numbers. [MC]
- Multiply complex numbers. [MC]
- Factor a sum of squares (SOS). [MC]
- Factor a quadratic perfect square trinomial (PST). [FR]
- Solve a system with a quadratic function and linear function. [MC]
- Solve a quadratic inequality. [FR].
- Factor a sum/difference of cubes (DOC, SOC). [FR]
- Factor by grouping. [FR]
- Factor a polynomial that is in quadratic form (QF). [MC]
- State the roots/zeros of a polynomial (and their multiplicity) given the factored form of the polynomial. [MC]
- Divide two polynomials. [FR]
- Write a function in standard form given the zeros and leading coefficient. [FR].
- Determine the characteristics of a polynomial given the graph of the function including up to: end behavior, x-intercept(s), y-intercepts, domain and range, possible degree. [FR]

From Previous Units

- Simplify an expression involving rational exponents. [FR]
- Solve a logarithmic equation. [MC]
- Construct a confidence interval given a sample mean and margin of error. [MC]

The following pages include practice problems to help you with studying for the skills on the exam. **It is not inclusive of everything** so please double check the list and look at notes and homeworks. Also, there will be a Unit 4 Review DeltaMath Practice assignment available for you to review as well.

Simplify or multiply radicals with negative numbers as the radicand.

1. $\sqrt{-4}$
2. $-\sqrt{-20}$
3. $\sqrt{-\frac{2}{5}}$
4. $\sqrt{-\frac{9}{25}}$

Add, subtract, and multiply complex numbers.

5. $(13+2i)+(-4-5i)$
6. $(3+2i)-(5+4i)$
7. $(1+6i)(4-3i)$

Compute to either i, -1, -i, or 1.

8. $i^{26}=$
9. $i^{315}=$
10. $i^{56}=$
11. $i^{95}=$

For the following questions, factor the expression using the best and most appropriate factoring method. Be able to factor an expression or give one of its factors.

12. Factor. x^2+64	13. Factor. $27x^3-64$	14. Factor. $1+512y^3$
15. Factor. $16x^2+8x+1$	16. $7x^3-2x^2-28x+8$	17. Is x^2+3 a factor of x^4-11x^2+24?

Use long division to divide the polynomials.

18. What is the remainder of:
$$\frac{4x^4-7x^3-24x^2+31x-19}{x-3}$$

19. What is the quotient of:
$$\frac{5x^4-15x^3+6x-13}{x-3}$$

20. $(3x^3+4x+11)\div(x^2-3x+2)$

21. $(2x^3-4x+7x^2+7)\div(x^2+2x-1)$

1. $8a^3 + c^3 =$

   A. $(2a + c)(2a + c)(2a + c)$ B. $(2a - c)(4a^2 + 2ac + c^2)$

   C. $(2a - c)(4a^2 + 4ac + c^2)$ D. $(2a + c)(4a^2 - 2ac + c^2)$

2. Which binomial is a factor of $(x^3 - x^2 + 3x - 3)$?

   A. $x - 3$ B. $x + 1$ C. $x^2 - 1$ D. $x^2 + 3$

3. $2x + 7 \overline{)\, 2x^4 + 21x^3 + 35x^2 - 37x + 46}$

   A. $x^3 + 7x^2 - 7x + 6 - \dfrac{4}{2x + 7}$

   B. $2x^3 + 14x^2 - 14x + 12 - \dfrac{4}{2x + 7}$

   C. $x^3 - 7x^2 + 7x - 6 + \dfrac{4}{2x + 7}$

   D. $x^3 + 7x^2 - 7x + 6 + \dfrac{4}{2x + 7}$

4. Divide:

   $(6x^3 - 11x^2 - 47x - 20) \div (2x + 1)$

   A. $3x^2 - 7x - 20$ B. $3x^2 + 7x - 20$

   C. $3x^2 - 4x - 20$ D. $3x^2 + 4x - 20$

5. Let $p(x) = x^3 - 3x^2 - 10x + 24$. What is the remainder when $p(x)$ is divided by $x - 1$?

   A. 0 B. 12 C. 24 D. 30

6. Which of the following is equivalent to i^{49}?

   A. i B. -1 C. $-i$ D. 1

7. Consider these two equations:

   $$y = 3x + 2$$
   $$y = -x^2 - 4x + 10$$

   Here are the first steps to solving this system of equations:

   $$3x + 2 = -x^2 - 4x + 10$$
   $$x^2 + 7x - 8 = 0$$
   $$(x - 1)(x + 8) = 0$$

   What is one solution to the system of equations?

   A. $(1, -8)$ B. $(-1, 8)$ C. $(1, 5)$ D. $(-1, -1)$

8. Solve: $y = 3x^2 + 3$
   $y = 5 - 5x$

   A. $\left\{\left(\frac{1}{3}, \frac{10}{3}\right), (2, 15)\right\}$ B. $\left\{\left(\frac{1}{3}, \frac{10}{3}\right), (-2, 15)\right\}$

   C. $\left\{\left(\frac{-1}{3}, \frac{20}{3}\right), (2, -5)\right\}$ D. $\left\{\left(\frac{-1}{3}, \frac{10}{3}\right), (-2, -5)\right\}$

9. Jessie is participating in an egg drop contest. He drops his protected egg from a window that is 100 feet above the ground. How many seconds, to the nearest tenth, will it take for the protected egg to reach the ground?

   Use the formula $d = \frac{1}{2}gt^2$ where:

   d is the distance traveled

   g is the acceleration due to gravity, which is $32\,\text{ft/sec}^2$

   t is the time in seconds

   A. 0.3 seconds B. 2.5 seconds

   C. 3.1 seconds D. 6.3 seconds

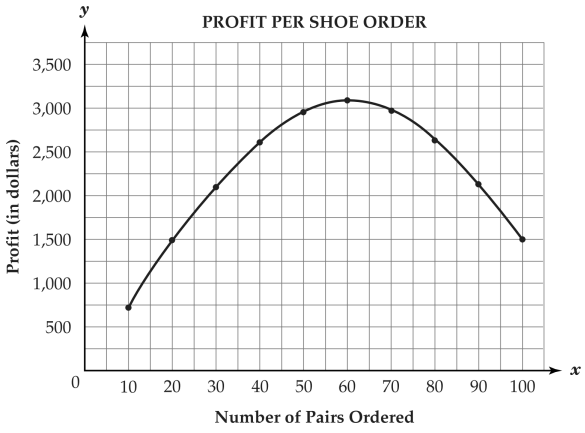
10. Each of the functions shown represents the height (in feet) of a rocket t seconds after being fired.

    $$h(t) = -16(t - 5)^2 + 576$$
    $$h(t) = -16(t + 1)(t - 11)$$

    What is the initial height of the rocket above the ground?

    A. 576 feet B. 400 feet C. 176 feet D. 11 feet

11. The profit that a shoe manufacturer makes is related to the number of pairs of shoes ordered, as shown in the graph below.



    How many pairs of shoes must be ordered for the manufacturer to make the greatest profit?

    A. 60 B. 100 C. 1,600 D. 3,100

12. Pedro throws a ball upward at a rate of 20 meters per second from an initial height of 2 meters. The height of the ball above the ground can be approximated by $h = -5t^2 + 20t + 2$, where t represents the amount of time, in seconds, since the ball has been released.

What is the maximum height that the ball reaches?

A. 5 meters B. 6 meters C. 20 meters D. 22 meters

13. A kangaroo in a single hop can reach a maximum height of 9 feet. The equation below can be used to determine h, the height in feet of the kangaroo's leap from the ground after t seconds.

$$h = -16t^2 + 24t$$

How many seconds would it take for the kangaroo to reach its maximum height from the ground?

A. 0.25 second B. 0.75 second

C. 1.50 seconds D. 1.75 seconds

14. The table shows the number of households with a telephone answering machine in selected years after 1980.

Years after 1980 (x)	4	6	8	10	12	14	16	18
Number of Households with Answering Machines	8.7	10.8	13.0	16.0	21.0	30.0	37.5	43.8

Using the data points, which quadratic equation *best* models this set of data?

A. $y = 8.4x^2 - 0.6x + 7.3$

B. $y = 0.15x^2 - 0.74x + 9.25$

C. $y = 0.2x^2 - 1.5x + 12$

D. $y = -0.008x^2 + 0.79x - 1.39$

15. State the degree and end behavior of $f(x) = 5 + 7x - 9x^2 + 4x^3$. Explain or show your reasoning.

16. The polynomial function $p(x) = x^3 - 3x^2 - 10x + 24$ has a known factor of $(x - 4)$.

a) Rewrite $p(x)$ as the product of linear factors.

b) Draw a rough sketch of the graph of the function.

17. Select the expression that is equivalent to $(m^2 - 25)$.

A. $(m^2 - 10m + 25)$ B. $(m^2 + 10m + 25)$

C. $(m - 5)(m + 5)$ D. $(m - 5)^2$

18. Let the function P be defined by $P(x) = x^3 + 7x^2 - 26x - 72$ where $(x + 9)$ is a factor. To rewrite the function as the product of two factors, long division was used but an error was made:

$$\begin{array}{r} x^2 + 16x + 118 \\ x + 9 \overline{)\, x^3 + 7x^2 - 26x - 72} \\ \underline{-x^3 + 9x^2} \\ 16x^2 - 26x \\ \underline{-16x^2 + 144x} \\ 118x - 72 \\ \underline{-118x + 1062} \\ 990 \end{array}$$

How can we tell by looking at the remainder that an error was made somewhere?

19. Which expression is equivalent to $162x^4 - 144x^2 + 32$?

Select *all* that apply.

- ❑ $2(81x^2 - 72x + 16)$
- ❑ $2(81x^2 + 4)(81x^2 + 4)$
- ❑ $2(81x^2 - 4)(81x^2 + 4)$
- ❑ $2(9x^2 - 4)(9x^2 - 4)$
- ❑ $2(9x^2 + 4)(9x^2 + 4)$
- ❑ $2(3x + 2)^2(3x - 2)^2$

20. The graph of the fourth-degee polynomial function $f(x)$ is shown in the coordinate plane below. Based on the graph, list all linear factors of $f(x)$.