Name:

Algebra II
Examination 7

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Thursday, January 20, 2022

The examination contains ten problems which are worth 10 points each, and two bonus problems worth ten points each.

Prob1	Prob2	Prob3	Prob4	Prob5	Prob6	Prob7	Prob8	Prob9	Prob10	Bonus1	Bonus2	Total

Problem 1. (Equation of a Line)
Write the slope-intercept form ($y = mx + b$) of the equation of the line which passes through the points $(7, 2)$ and $(15, -2)$.

Problem 2. (Factoring Cubics)
Solve the equation $x^3 - 3x^2 - 4x + 12 = 0$. Correctly write the solution set.

Problem 3. (Solving rational equations)
Let $f(x) = \dfrac{x^2 - 8x - 26}{x - 4}$. Solve the equation $f(x) = 5$. Correctly write the solution set.

Problem 4. (Remainder Theorem)
Let $g(x) = x^5 + 7x^4 + 8x^3 - 7x^2 + 12x + 8$ and $f(x) = x + 5$. Find the quotient and remainder when g is divided by f.

Problem 5. (Domain and Range)
Let $f(x) = \dfrac{7x - 16}{2x - 9}$. Find the domain and range of f.

Problem 6. (Domain and Range)
Let $f(x) = \sqrt{x+7} - 5$. Find the domain and range of f.

Problem 7. (Absolute Value Inequalities)
Solve the inequality $|2x - 7| \leq 5$. Write the solution using correct interval notation.

Problem 8. (Rational Inequalitie)
Solve the inequality $\dfrac{x^2 - 9}{x^2 - 16} \geq 0$. Write the solution using correct interval notation.

Problem 9. (Standard Sets)
Of the sets $\mathbb{N}$, $\mathbb{Z}$, $\mathbb{Q}$, $\mathbb{R}$, and $\mathbb{C}$, state the smallest set which contains all solutions to the given equation.

(a) $x^2 - 2x - 15 = 0$

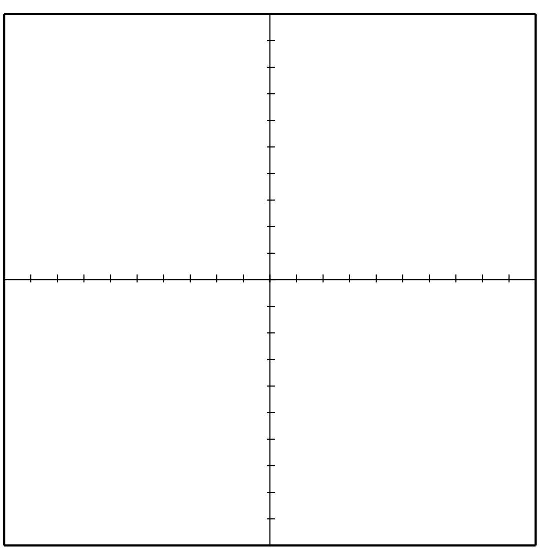
(b) $x^2 - 2x + 15 = 0$

(c) $x^2 - 8x + 15 = 0$

(d) $3x^2 = 7x$

(e) $3x^2 = 7$

Problem 10. (Graphing)
Consider the rational function $f(x) = \dfrac{x-4}{x+2}$. Find its degree, zeros, and poles. Find its intercepts and asymptotes. Graph the function and label these features.



Rational Function: $f(x) = \dfrac{x-4}{x+2}$

Degree:

Zeros:

Poles:

y-intercept:

x-intercepts:

Vertical Asymptotes:

Polynomial Asymptote:

Problem 11. (Bonus)
We have defined a^n when n is a positive integer, and we have seen these properties:

(1) $a^{m+n} = a^m \cdot a^n$

(2) $(a^m)^n = a^{mn}$

Using property **(1)**, we extended this definition to see that

(3) $a^0 = 1$.

(a) Let n be a positive integer. Use properties **(1)** and **(3)** to show that $a^{-n} = \dfrac{1}{a^n}$.

(b) Let p and q be positive integers. Use property **(2)** to show that $a^{p/q} = \sqrt[q]{a^p}$.

Problem 12. (Bonus)
Compute the following sets. Write your answer using correct set notation.

Let $A = [3, 11]$, $B = (7, 15)$, and $C = \{1, 3, 7\}$.

(a) $A \cup B$

(b) $A \cap B$

(c) $A \smallsetminus B$

(d) $B \smallsetminus A$

(e) $A \smallsetminus C$