February Regional **Algebra 2 Team** **Question #1.**

A = The slope of the line: $\frac{1}{4}y - 3x = 5$

B = The slope of the line: $6x - 2y = 7$

C = The slope of the line: $y - 3 = \frac{2}{3}(x + 1)$

D = The slope of the line: $\frac{x}{6} + \frac{y}{4} = 1$

Summary: Find the value of the expression: A + B + C + D

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Summary: Find the value of the expression: A + B + C + D

February Regional Algebra 2 Team Question #2.

A = The sum of the zeros of the function: $f(x) = 4x^2 - 24x + 35$

B = The sum of the zeros of the function: $g(x) = \log_5(x - 5)$

C = The sum of the zeros of the function: $h(x) = -2|x - 1| + 3$

D = The sum of the zeros of the function: $j(x) = \sqrt{8 - x} - 9$

Summary: Find the value of the expression: $\mathrm{A} - \mathrm{B} + \mathrm{C} - \mathrm{D}$

February Regional Algebra 2 Team Question #2.

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Summary: Find the value of the expression: $\mathrm{A} - \mathrm{B} + \mathrm{C} - \mathrm{D}$

February Regional Algebra 2 Team Question #3.

A = The sum of the solutions of the equation: $9^{2-x} = 27^{x+5}$

B = The sum of the solutions of the equation: $\ln(x+5) = \ln(x+50) - \ln(x+2)$

C = The sum of the solutions of the equation: $3 + 8\log_2 x = -13$

D = The sum of the solutions of the equation: $\log_3(\log_3(4x+7)) = 0$

Summary: Find the value of the expression: 5A + 2B + 4C + 3D

February Regional Algebra 2 Team Question #3.

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Summary: Find the value of the expression: 5A + 2B + 4C + 3D

February Regional **Algebra 2 Team** **Question #4.**

Find the product of the zeros for each of the following functions. In the event that there is only one zero, just report that one value.

A: $f(x) = 8x - 3$

B: $g(x) = x^2 + 9x + 8$

C: $h(x) = \frac{x^3 + x^2 - 9x - 9}{x^3 - 3x^2 - 4x + 12}$

D: $k(x) = 5(3)^{x-2} - 5$

Summary: Find the value of the expression: ABCD

February Regional **Algebra 2 Team** **Question #4.**

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A: $f(x) = 8x - 3$

B: $g(x) = x^2 + 9x + 8$

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D: $k(x) = 5(3)^{x-2} - 5$

Summary: Find the value of the expression: ABCD

February Regional — Algebra 2 Team — Question #5.

A = The domain of $f(x) = \sqrt{25 - x^2}$

B = The domain of $g(x) = x^2 + 3x + 16$

C = The domain of $h(x) = \log(14 - 7x)$

D = The domain of $k(x) = 4 - |x - 5|$

Summary: Find the intersection $A \cap B \cap C \cap D$

February Regional — Algebra 2 Team — Question #5.

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Summary: Find the intersection $A \cap B \cap C \cap D$

February Regional — Algebra 2 Team — Question #6.

A: $x^2 + \frac{1}{x^2} = A$ where $x + \frac{1}{x} = 7$

B: $x - y = B$ where $x + y = 10$ and $x^2 - y^2 = 17$

C: $x^2 + \frac{1}{x^2} = C$ where $x - \frac{1}{x} = -3$

D: $x + y = D$ where $x^3 + y^3 = 30$ and $x^2 - xy + y^2 = 3$

Summary: $A - C - BD$

February Regional — Algebra 2 Team — Question #6.

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D: $x + y = D$ where $x^3 + y^3 = 30$ and $x^2 - xy + y^2 = 3$

Summary: $A - C - BD$

A = The distance between the centers of the circles $y^2 = 9-(x-4)^2$ and $x^2 - 5 = -(y+3)^2$.

B = The distance between the vertices of the parabolas $y = \frac{2}{3}(x+1)^2$ and $y = \frac{1}{5}(x+7)^2$.

C = The product of the lengths of the latus rectums of the parabolas $x = 4(y+2)^2$ and $x = -\frac{1}{4}(y-6)^2$.

D = The distance between the vertices of the parabolas $3x^2 - 30x + 7y + 5 = 0$ and $y^2 + 16y - 8x + 144 = 0$.

Summary: Find the value of the expression: $\mathrm{ABC} + \mathrm{D}^2$

February Regional **Algebra 2 Team** **Question #7.**

A = The distance between the centers of the circles $y^2 = 9-(x-4)^2$ and $x^2 - 5 = -(y+3)^2$.

B = The distance between the vertices of the parabolas $y = \frac{2}{3}(x+1)^2$ and $y = \frac{1}{5}(x+7)^2$.

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Summary: Find the value of the expression: $\mathrm{ABC} + \mathrm{D}^2$

<u>**February Regional**</u> **Algebra 2 Team** **Question #8.**

A: $(A, 0)$ is the x-intercept of the graph of the function $f(x) = \begin{cases} x + 2, & if\ x < -5 \\ 2x - 5, & if -5 \le x \le 0 \\ -\frac{1}{3}x + 1. & if\ 0 < x < 4 \\ -x - 4, & if\ x \ge 4 \end{cases}$

B: $(B, 0)$ is the x-intercept farthest to the right of the graph of the function $g(x) = -4x^3(x+5)^2(x-7)$.

C: $(C, 0)$ is the real x-intercept of the graph of the function $h(x) = \frac{x^3 - 2x^2 + 4x - 8}{x - 5}$.

D: $(D, 0)$ is the x-intercept farthest to the left on the graph of the function $k(x) = |2x - 9| - 3$

Summary: Find the value of the expression: $AB - CD$

<u>**February Regional**</u> **Algebra 2 Team** **Question #8.**

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Summary: Find the value of the expression: $AB - CD$

February Regional **Algebra 2 Team** **Question #9.**

A: $(2i)^7 = Ai$, where A is a real number and $i = \sqrt{-1}$.

B: $(1+4i)^2 + (-3-5i)^2 = -31 + Bi$, where B is a real number and $i = \sqrt{-1}$.

C: $(2+i)^4 = C + 24i$, where C is a real number and $i = \sqrt{-1}$.

D: $(1+i)^4 + (1+i)^8 = D$, where D is a real number and $i = \sqrt{-1}$.

Summary: Find the value of the expression: $\frac{3A}{D} + \frac{B}{2} + C$

February Regional **Algebra 2 Team** **Question #9.**

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D: $(1+i)^4 + (1+i)^8 = D$, where D is a real number and $i = \sqrt{-1}$.

Summary: Find the value of the expression: $\frac{3A}{D} + \frac{B}{2} + C$

February Regional — Algebra 2 Team — Question #10.

Assign a value to each system below based on how many solutions it has. A system with no solutions is worth 1 point, a system with 1 solution is worth 2 points and a system with infinitely many solutions is worth 3 points.

A = The value of the system: $\begin{cases} 2x + y = 4 \\ 2x + y = 1 \end{cases}$

B = The value of the system: $\begin{cases} y = \frac{5}{2}x - 3 \\ 2x + 5y = -6 \end{cases}$

C = The value of the system: $\begin{cases} 3x - y + 2z = 4 \\ 2x - y + 3z = 10 \\ 6x - 2y + 4z = 8 \end{cases}$

D = The value of the system: $\begin{cases} y = 3(x-4)^2 + 3 \\ y = -\frac{1}{2}(x-6)^2 + 1 \end{cases}$

Summary: Find the value of the expression: $\frac{A}{B} + \frac{C}{D}$

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D = The value of the system: $\begin{cases} y = 3(x-4)^2 + 3 \\ y = -\frac{1}{2}(x-6)^2 + 1 \end{cases}$

Summary: Find the value of the expression: $\frac{A}{B} + \frac{C}{D}$

February Regional Algebra 2 Team Question #11.

A function is increasing on an open interval I if $f(x_1) < f(x_2)$ whenever $x_1 < x_2$ and $x_1, x_2 \in I$.

A = The interval on which $f(x) = |3x + 6|$ is increasing.

B = The interval on which $g(x) = x^3$ is increasing.

C = The interval on which $h(x) = \sqrt{2x - 8}$ is increasing.

D = The interval on which. $k(x) = -(x - 7)^2 - 10$ is increasing.

Summary: Find the intersection of $A \cap B \cap C \cap D$

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D = The interval on which. $k(x) = -(x - 7)^2 - 10$ is increasing.

Summary: Find the intersection of $A \cap B \cap C \cap D$

February Regional   Algebra 2 Team   Question #12.

A = The **x**-coordinate of the intersection of $f^{-1}(x)$ and $g^{-1}(x)$, where $f(x) = 2x - 8$ and $g(x) = 3x - 12$.

B = $(0, B)$ is the y-intercept of $h^{-1}(x)$ where $h(x) = \sqrt[3]{x-5}$.

C = $(0, C)$ is the y-intercept of the inverse of the function $j(x) = \frac{2x-8}{x-3}$.

D: $(0, D)$ is the y-intercept of the inverse of the function $F(x) = (x-1)^2 - 9, x < 1$

Summary: Evaluate the expression $B - A - C - D$

February Regional   Algebra 2 Team   Question #12.

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B = $(0, B)$ is the y-intercept of $h^{-1}(x)$ where $h(x) = \sqrt[3]{x-5}$.

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D: $(0, D)$ is the y-intercept of the inverse of the function $F(x) = (x-1)^2 - 9, x < 1$

Summary: Evaluate the expression $B - A - C - D$

February Regional Algebra 2 Team Question #13.

Find the sum of the solutions for each of the following equations. In the event that there is only one solution, just report that one value.

A: $5x^{\frac{2}{3}} = 125$

B: $x^{-1/4} + 3 = 8$

C: $x^{\frac{7}{6}} = 128$

D: $\left(\frac{2}{3}\right)^{2x} = \frac{27}{8}$

Summary: Evaluate the expression $A + \frac{1}{B} - CD$

February Regional Algebra 2 Team Question #13.

Find the sum of the solutions for each of the following equations. In the event that there is only one solution, just report that one value.

A: $5x^{\frac{2}{3}} = 125$

B: $x^{-1/4} + 3 = 8$

C: $x^{\frac{7}{6}} = 128$

D: $\left(\frac{2}{3}\right)^{2x} = \frac{27}{8}$

Summary: Evaluate the expression $A + \frac{1}{B} - CD$

February Regional **Algebra 2 Team** **Question #14.**

A: The sum of the solutions to $|x - 7| = 10$

B: The sum of the solutions to $|40 - 8x| = 16$

C: The sum of the solutions to $|x^2 - 5x| = 6$

D: The sum of the solutions to $|x^2 + 6x| = 4$

Summary: Evaluate the expression $A + B + C + D$

February Regional **Algebra 2 Team** **Question #14.**

A: The sum of the solutions to $|x - 7| = 10$

B: The sum of the solutions to $|40 - 8x| = 16$

C: The sum of the solutions to $|x^2 - 5x| = 6$

D: The sum of the solutions to $|x^2 + 6x| = 4$

Summary: Evaluate the expression $A + B + C + D$

February Regional Algebra 2 Team Question #15.

Let $f(x) = \log_5 x$ $g(x) = \log x$ $h(x) = \ln x$ $k(x) = 6 + \log_2 x$

A $= f(125)$

B $= g\left(\frac{1}{1000}\right)$

C $= h(e^5)$

D $= k(1)$

Summary: Find the product: ABCD

February Regional Algebra 2 Team Question #15.

Let $f(x) = \log_5 x$ $g(x) = \log x$ $h(x) = \ln x$ $k(x) = 6 + \log_2 x$

A $= f(125)$

B $= g\left(\frac{1}{1000}\right)$

C $= h(e^5)$

D $= k(1)$

Summary: Find the product: ABCD