Team: **Seat #:** **Name:** **Academy I Team Quiz 1**

Show all work. When there is no work to show, explain your reasoning in complete sentences.

1. Simplify $\frac{96(2x^3y)^{-3}}{6x^{-10}yz^{-2}}$ **$2xy^{-4}z^2$**

2. Divide $2x^4 + 6x^3 - 10x - 9$ by $x - 2$. **$2x^3 + 10x^2 + 20x + 30 + \frac{51}{x-2}$**

3. Factor $2x^5 + 10x^4 - 18x^3 - 90x^2$ completely. **$2x^2(x + 5)(x - 3)(x + 3)$**

4. Sketch $y = -x^3 + 5x - 10$. Mark four points on the curve and label their coordinates.

5. How many of the sets below contain only rational numbers? **four**

$\mathbb{R}$ $\mathbb{Q}$ $\mathbb{Z}$ $\{ -1, 0, 1 \}$ $\{ \frac{1}{4}, \frac{1}{2}, -\frac{3}{4} \}$ $\{ \sqrt{2}, -\sqrt{3} \}$

Team:
Simplify. Do not use negative exponents in your answer.

Team:
Sketch $y = 2x^4 - 10x$. Mark four points on the curve and label their coordinates.

Team:
Divide $8x^3 + 10x^2 - 6x + 1$ by $2x + 3$.

Team:
Factor $240x^3 + 380x^2 + 150x$ completely.

Team:
State three real numbers, only the last of which is rational.

Team: **Seat #:** **Name:** **Math Academy I Team Quiz 2-I**

Show all work. When there is no work to show, explain your reasoning in complete sentences.

1. State the inverse of $f(x) = x^3 - 8$.

$(x + 8)^{1/3}$

2. If $h(3) = 6$, find $h^{-1}(3)$ and $h^{-1}(6)$ if possible.

$h^{-1}(6) = 3$
$h^{-1}(3)$ is unknown

3. Find $f(g(x))$ given $f(x) = 2x^2 - 3x + 10$ and $g(x) = x - 5$.

$2x^2 - 23x + 75$

4. Find $a(a(c^{-1}(c(b(c(a(c(4)))))))))$ given $a(x) = x - 5$, $b(x) = 6$, and $c(x) = 9x^3 - 8x + ½$.

-4

5. Sketch and label $f(x) = \sqrt{x}$, $p(x) = -\sqrt{x}$, $q(x) = \sqrt{-x}$, and $r(x) = \sqrt{x + 4} + 2$ on the same set of axes.

Team:
State the inverse of $m(x) = 3x - 10$.

Team:
Given $v(5) = 10$, fill in whatever blanks have known values and leave the others blank.
$v(10) =$ _____
$v^{-1}(5) =$ _____
$v^{-1}(10) =$ _____

Team:
Find $f(g(x))$ given $f(x) = 2x^2 - 3x + 10$ and $g(x) = x - 5$.

Team:
Find $g(g(f(10)))$ given $f(x) = 2x^2 - 3x + 10$ and $g(x) = x - 5$.

Team:
Sketch $y = 2\sqrt{x + 4}$, and explain how it is different from the graph of $y = \sqrt{x}$.

Team: **Seat #:** **Name:** **Math Academy I Team Quiz 2-II**

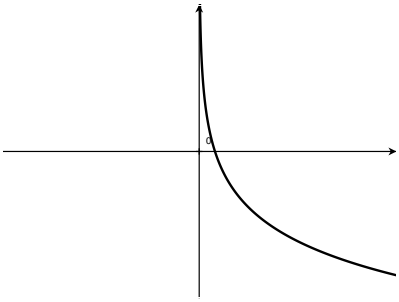
Show all work. When there is no work to show, explain your reasoning in complete sentences.

1. Solve $4^{(2-x)} + 25 = 212$ **$x = -1.77$**

2. State the domain of $a(x) = \log(6 - \sqrt{2x-8})$. **$4 \le x < 22$**

3. Find all real solutions to $131 + 2(2x - 10)^{6/5} = 3$. **none**

4. Give two or more reasons why the graph below cannot be of the function $f(x) = 1.5^x$.



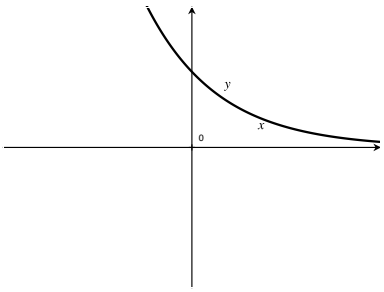
5. How long will it take a population to triple if it is increasing at a rate of 150% per year? **1.20 years**

Team:
Solve $284 = 2(3^{5x})$.

Team:
State the domain of $b(x) = \log (x^2 - 25)$.

Team:
Find all real solutions to $131 + 2(2x - 10)^{7/5} = 3$.

Team:
Give two reasonable possibilities for the equation of the graph at right.



Team:
How long will it take a substance decaying at a rate of 0.6% per hour to decrease in mass from 20 grams to 8 grams?

Team: **Seat #:** **Name:** **Math Academy I Team Quiz 3-I**

Show all work. When there is no work to show, explain your reasoning in complete sentences.

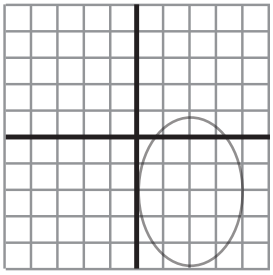
1. Simplify $\frac{10}{20 + \sqrt{8}}$.

$\frac{50 - 50\sqrt{2}}{98}$

2. Factor $1000x^4 - 8xy^6$.

$8x\,(5x - y^2)\,(25x^2 + 5xy^2 + y^4)$

3. Sketch $\frac{(x-2)^2}{2} + \frac{(y+2)^2}{4} = 2$.



4. Simplify $\sqrt[3]{10xy^{11}} \cdot \sqrt[3]{12x^5y^6}$.

$2x^2y^5\sqrt[3]{15y^2}$

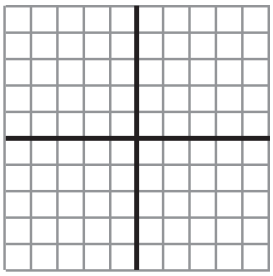
5. Sketch the parabola $y = x^2 - 10x + 34$ and find the vertex, the maximum or minimum value, the equation of the axis of symmetry, the equation of the parabola in vertex form, the zeros, and the x-intercepts.

vertex: (5, 9)
zeros: $x = 5 \pm 3i$
x-intercepts: none
minimum value: $y = 9$
axis of symmetry: $x = 5$
vertex form: $y = (x - 5)^2 + 9$

Team:
Simplify $\frac{2}{\sqrt{18+8}}$.

Team:
Factor $10x^5 + 80x^2$.

Team:
Sketch $\frac{(x+1)^2}{9} + \frac{(y-3)^2}{4} = 1$.



Team:
Simplify $\sqrt{10xy^{11}} \cdot \sqrt{12x^5y^6}$.

Team:
Sketch the parabola $y = x^2 + 8x + 18$ and find the vertex, the equation of the axis of symmetry, the maximum or minimum value, the equation of the parabola in vertex form, and the x-intercepts (if any).

Team: **Seat #:** **Name:** **Math Academy I Team Quiz 3-II**

Show all work.

1. Simplify $\frac{6 + i^{309}\sqrt{10}}{2\sqrt{2}}$.

$\frac{3\sqrt{2} + i\sqrt{5}}{2}$

2. Solve $3x^2 (x^2 + 9x + 20) (2x - 3) = 0$.

$x = 0$
$x = -4$
$x = -5$
$x = {}^3/_2$

3. Find all solutions to $2(3x + 15)^2 + 329 = 5$.

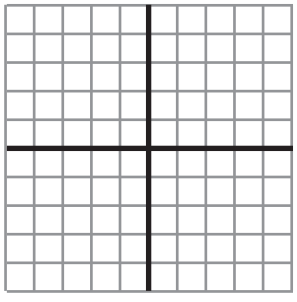
$x = -5 \pm 3i\sqrt{2}$

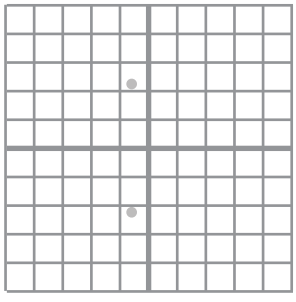
4. Divide $\frac{2 + 5i}{4 + 6i}$, and write the answer in $a + bi$ form.

$\frac{19}{26} + \frac{2}{13}i$

5. Find the roots of $2x^2 + 3x + 10$, and plot them on the complex plane.

$x \approx -0.75 \pm 2.11i$





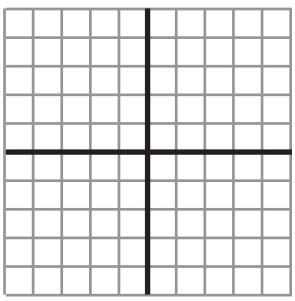
Team:
Simplify $\frac{i^{342}}{\sqrt{8}}$.

Team:
Solve $4x\,(x + 2)\,(5x - 1) = 0$.

Team:
Solve $10 + (2x - 8)^2 = 34$

Team:
Divide $\frac{3 + i}{2 - 4i}$, and write the answer in $a + bi$ form.

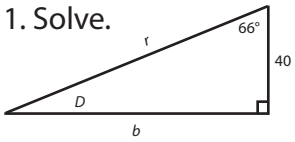
Team:
Solve $2(x - 5)^2 + 10 = -22$, and plot the solutions on the complex plane.



Team: **Seat #:** **Name:** **Math Academy I Team Quiz 4**

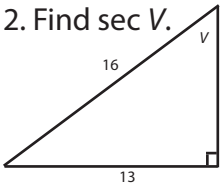
Show all work. When there is no work to show, explain your reasoning in complete sentences.

1. Solve.



$D = 24°$
$b = 89.8$
$r = 98.3$

2. Find sec V.



1.72

3. Simplify $\tan^2 x + 1$.

$\sec^2 x$

4. How many of the following equations have solutions?

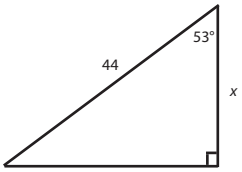
five

$\sin x = 0.8$	$\tan x = 0.8$	$\sec x = 0.8$	$\sin^{-1} x = 8°$
$\cos x = 1.8$	$\cot x = 1.8$	$\csc x = 1.8$	$\sin^{-1} 18° = x$

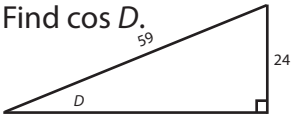
5. A road needs to rise 480 meters vertically into the mountains. What is the minimum length of this road if it does not exceed an angle of elevation of 4°?

6.9 km

Team:
Solve for x.



Team:
Find cos D.



Team:
Simplify $\sin^2 x + \cos^2 x$.

Team:
Cross out each equation below that has no solution.

$\sin x = 1.2$	$\tan x = 1.2$	$\sec x = 1.2$	$\cos^{-1} 40° = x$
$\cos x = 0.2$	$\cot x = 0.2$	$\csc x = 0.2$	$\tan^{-1} x = 50°$

Team:
How high does a 22-meter tree reach if it is leaning at a 6° angle?