# Standards for showing work and writing conclusions to math problems in MTH 95

Notation is an important part of how we communicate the results to a mathematical problem. Here is a quick reference for how to write your answers for this course:

| Problem Type | Special Notes | How to write your answer | Possible Example<br><br>(Check with your instructor for how they prefer you to show your work.) |
|---|---|---|---|
| **Evaluating an expression.** | Evaluating means you have an expression (there is no equal sign in the statement of what you are asked to do). You will often times see the word "evaluate," "state," or "find." | Show your substitution step and then work out the arithmetic using equal signs before each line to show equivalency of the expressions. | <u>Evaluate</u> $f(-2)$ for $f(x) = 2x^2 + 5x - 3$.<br>$f(-2) = 2(-2)^2 + 5(-2) - 3$<br>$= 2(4) - 10 - 3$<br>$= 8 - 10 - 3$<br>$= -5$ |
| | | If you cannot evaluate, state that the value is *undefined*. DO NOT say "no solution" because you are not *solving*. | <u>Evaluate</u> $f(1)$ for $f(x) = \frac{1}{x-1}$.<br>$f(1)$ is undefined. |
| **Simplifying an algebraic expression.** | Remember, an algebraic expression represents a number which is dependent on the value we choose for the variable. To write an equivalent expression means that both expression hold the same value no matter what we choose for the variable. You will often times see the word "simplify" in the directions. | Since we are writing equivalent expressions we want to use an equal sign to signify that each subsequent expression is equivalent to the previous. | <u>Simplify</u> the expression $\dfrac{\frac{3}{x-1}}{\frac{1}{x-1}+\frac{3}{x}}$.<br>$\dfrac{\frac{3}{x-1}}{\frac{1}{x-1}+\frac{3}{x}} = \dfrac{\frac{3}{x-1}}{\frac{1}{x-1}+\frac{3}{x}} \cdot \dfrac{\frac{x\cdot(x-1)}{1}}{\frac{x\cdot(x-1)}{1}}$<br>$= \dfrac{\frac{3}{\cancel{x-1}}\cdot\frac{x\cdot\cancel{(x-1)}}{1}}{\frac{1}{\cancel{x-1}}\cdot\frac{x\cdot\cancel{(x-1)}}{1}+\frac{3}{\cancel{x}}\cdot\frac{\cancel{x}\cdot(x-1)}{1}}$<br>$= \dfrac{3x}{x+3(x-1)}$ $\quad x \neq 0$ and $x \neq 1$<br>$= \dfrac{3x}{x+3x-3}$ $\quad x \neq 0$ and $x \neq 1$<br>$= \dfrac{3x}{4x-3}$ $\quad x \neq 0$ and $x \neq 1$ |



Updated: 9 June 2015

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| **Solving an equation.** | You be given an equal sign between two algebraic expressions. You will often times see the word "solve" in the directions. | Show your work with your equal signs lined up in the middle of each equation.<br><br>Do not put equal signs on the left.<br><br>State what the solution is in a sentence and use either set builder or interval notation as asked for in the directions. | Solve $f(x) = 10$ when $f(x) = -2x^2 + 4x + 40$.<br>$-2x^2 + 4x + 40 = 10$<br>$-2x^2 + 4x + 30 = 0$<br>$-2(x^2 - 2x - 15) = 0$<br>$-2(x - 5)(x + 3) = 0$<br>$x - 5 = 0$ OR $x + 3 = 0$<br>$x = 5$ OR $x = -3$<br>So the solutions are 5 and 3 and the solution set is {5,-3}.<br>OR So the solutions are 5 and 3 and the solution set is $\{x \| x = 5 \text{ or } x = -3\}$. |
| | | If there are an infinite number of solutions, communicate this using the "set of all real numbers" symbol. | Solve $3(x - 5) + 1 = 2x - 14 + x$ for $x$.<br>$3(x - 5) + 1 = 2x - 14 + x$<br>$3x - 15 + 1 = 3x - 14$<br>$3x - 14 = 3x - 14$<br>$3x - 14 - 3x = 3x - 14 - 3x$<br>$-14 = -14$ Is a true statement.<br>So every real number is a solution and the solution set is $\mathbb{R}$.<br>OR So every real number is a solution and the solution set is $\{x \| x \in \mathbb{R}\}$. |
| | | If there is no solution, communicate this using either of the empty set symbols. | Solve $x + 2 = x + 1$ for $x$.<br>$x + 2 = x + 1$<br>$x + 2 - x = x + 1 - x$<br>$2 = 1$ Is not a true statement.<br>So there are no solutions and the solution set is {}.<br>OR So there are no solutions and the solution set is $\emptyset$. |



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<table>
<tr><th>Problem Type</th><th>Special Notes</th><th>How to write your answer</th><th>Possible Example<br><br>(Check with your instructor for how they prefer you to show your work.)</th></tr>
<tr><td rowspan="3">Solving an inequality.</td><td rowspan="3">You be given an inequality symbol<br><br>$(<, >, \leq, \text{or } \geq)$<br><br>between two algebraic expressions. You will often times see the word “solve” in the directions.</td><td>Show your work with your inequality signs lined up in the middle of each inequality.<br><br>Do not put equal signs on the left.<br><br>State what the solution is in a sentence and use either set builder or interval notation as asked for in the directions.</td><td>Solve $|w-2| \leq 4$ for $w$.<br><br>$w-2 \leq 4$<br>$w \leq 6$<br><br>AND<br><br>$-(w-2) \leq 4$<br>$-w+2 \leq 4$<br>$-w \leq 2$<br>$w \geq -2$<br><br>So any number greater than or equal to -2 AND less than or equal to 6 is a solution and the solution set is $\{w \mid -2 \leq w \leq 6\}$.<br>OR So any number greater than or equal to -2 AND less than or equal to 6 is a solution and the solution set is $[-2, 6]$.</td></tr>
<tr><td>If there are an infinite number of solutions, communicate this using the “set of all real numbers” symbol.</td><td>Solve $w+2 \leq w+4$ for $w$.<br><br>$w+2 \leq w+4$<br>$2 \leq 4$ Is a true statement.<br>So every real number is a solution and the solution set is $\mathbb{R}$.<br>OR So every real number is a solution and the solution set is $(-\infty, \infty)$.</td></tr>
<tr><td>If there is no solution, communicate this using either of the empty set symbols.</td><td>Solve $w+4 \leq w+2$ for $w$.<br><br>$w+4 \leq w+2$<br>$4 \leq 2$ Is not a true statement.<br>So there are no solutions and the solution set is $\{\}$.<br>OR So there are no solutions and the solution set is $\emptyset$.</td></tr>
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| **Solving word problems.** | These problems will generally describe a situation and a relationship between two variables with units defined for each variable. | Write your answer as a complete sentence, giving a contextual conclusion which answers the question being asked. | If a rock falls from a height of 20 meters on Earth, the height $H$, in meters, $x$ seconds after it began to fall is approximately<br><br>$H(x) = 20 - 4.9x^2$.<br><br>What is the height of the rock 1 second after beginning its fall?<br><br>$H(1) = 20 - 4.9(1)^2$<br>$= 20 - 4.9$<br>$= 15.1$<br>The height of the rock 1 second after beginning its fall is approximately 15.1 meters. |
| **Stating the domain and range of a function.** | There are different rules for different types of functions. Be sure that you start solving for the domain correctly based on the type of function (often rational or square root) you are dealing with. | Write your answers in either set builder or interval notation (as directed). | State the domain of $f(x) = \dfrac{1}{x-2}$.<br><br>$f(x)$ is undefined when $x - 2 = 0$.<br><br>$x - 2 = 0$<br>$x = 2$<br>So the domain of $f$ is $\{x \mid x \neq 2\}$.<br>OR So the domain of $f$ is $(-\infty, 2) \cup (2, \infty)$. |
| | | | State the domain of $f(x) = \sqrt{3x - 6}$.<br><br>$f(x)$ is only defined when $3x - 6 \geq 0$.<br><br>$3x - 6 \geq 0$<br>$3x \geq 6$<br>$x \geq 2$<br>So the domain of $f$ is $\{x \mid x \geq 2\}$.<br>OR So the domain of $f$ is $[2, \infty)$. |



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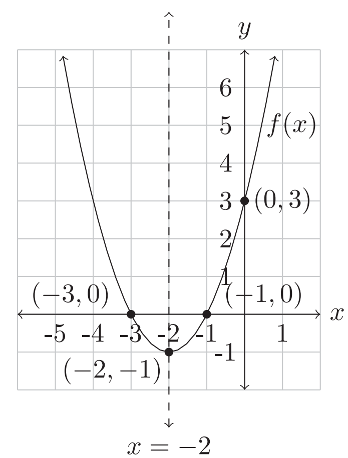
| **Rectangular Coordinate System Guidelines.** | Remember, the graph is a picture of the solutions to the equation. The horizontal-axis (often the $x$-axis) and vertical-axis (often the $y$-axis) are the *coordinate system* or *coordinate plane* which we draw the graph onto. | Label your *horizontal* and *vertical* axes (often $x$ and $y$) with an appropriate scale, label the graph with its equation and any points required by your instructor (often the vertical intercept, vertex, horizontal intercept(s) and sometimes others). | Graph the function $f(x) = (x+2)^2 - 1$.<br><br>The vertex is $(-2, -1)$ and the axis of symmetry is $x = -2$.<br><br>$f(0) = (0+2)^2 - 1$<br>$= 4 - 1$<br>$= 3$<br>So the $y$-intercept is $(0, 3)$.<br><br>$0 = (x+2)^2 - 1$<br>$1 = (x+2)^2$<br>$\pm 1 = x + 2$<br>$-2 \pm 1 = x$<br><br>$x = -2 + 1$ OR $x = -2 - 1$<br>$x = -1$ OR $x = -3$<br><br>So the $x$-intercepts are $(-3, 0)$ and $(-1, 0)$.<br><br><br> |



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