**Name:** _____ **Date:** _____

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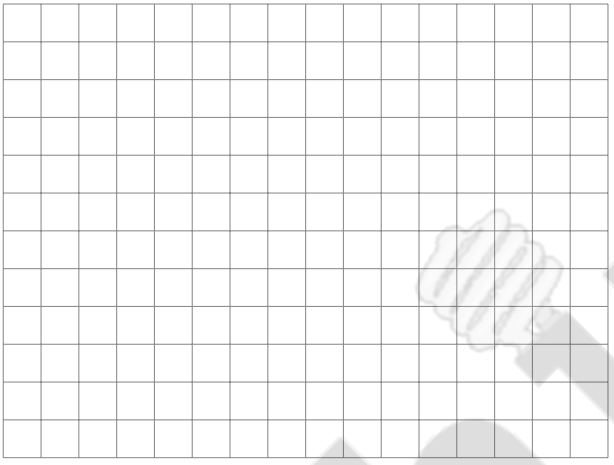
# Sigma($\sigma$)
# Sample Homework

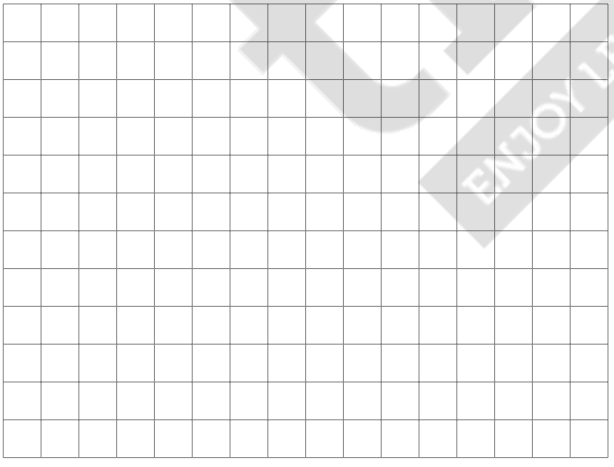
**Start Time:** _____ **End Time:** _____

# 1 - Graph Absolute Value Functions

1. $f(x) = |x + 7| + 4$



2. $f(x) = -2|x + 10| - 1$



3. $f(x) = -3|x+1| - 2$

4. $f(x) = \frac{1}{4}|x-4| + 3$

# 2 - Operations with Exponents

Simplify the following expressions. The answer should be in simplified radical form.

- $\sqrt[3]{8\left(\frac{8^{-5}}{8^{3}}\right)} =$
- $\left(8\left(\frac{8^{-2}}{8^{8}}\right)\right)^{\frac{1}{2}} =$
- $\sqrt[3]{(5^{-4}\cdot 5^{3})^{7}} =$
- $\sqrt[3]{(-4)^{-8}\cdot 4^{-9}} =$
- $\sqrt{\left|(-6)\left(\frac{(-6)^{-3}}{(-6)^{-2}}\right)\right|} =$
- $\left((-5)^{-9}\cdot 5^{-5}\right)^{-\frac{1}{2}} =$

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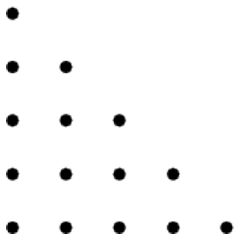
# 3 - Problems

1. $\left[\diamond\,{}^{10}_{13}\right]$ $[AY_{13}]$ There are 5 yellow pegs, 4 red pegs, 3 green pegs, 2 blue pegs, and 1 orange peg to be placed on a triangular peg board. In how many ways can the pegs be placed so that no (horizontal) row or (vertical) column contains two pegs of the same color? *(AMC10)*



2. $\left[\diamond\,{}^{10}_{10}\right]$ $[AY_{10}]$ The sides of a triangle with positive area have lengths 4, 6, and $x$. The sides of a second triangle with positive area have lengths 4, 6, and $y$. What is the smallest positive number that is **not** a possible value of $|x-y|$? *(AMC10)*

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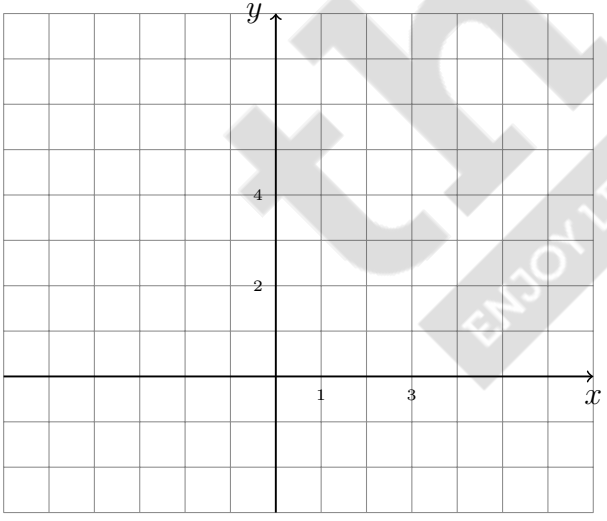
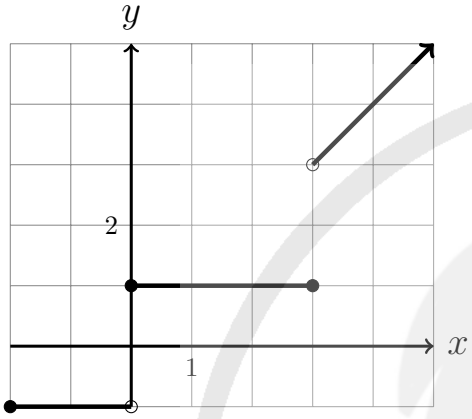
# 4 - Piecewise Functions

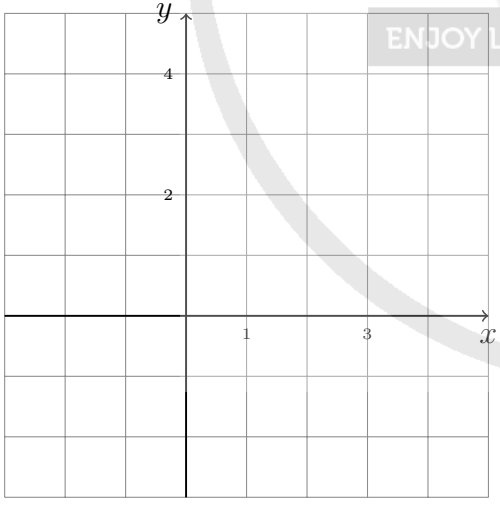
1. Graph the function $f(x) = \begin{cases} -2x-3, & \text{if } x \leq -3 \\ 2x+3, & \text{if } -3 < x < 1 \\ -x, & \text{if } x \geq 1 \end{cases}$



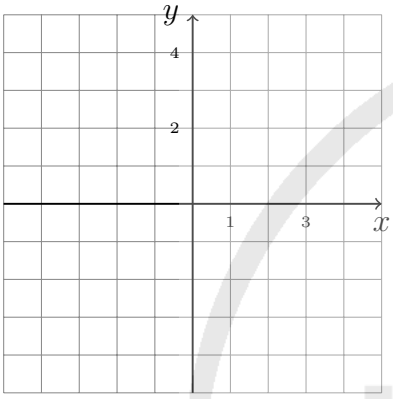
2. Write the piecewise function for the graph shown.



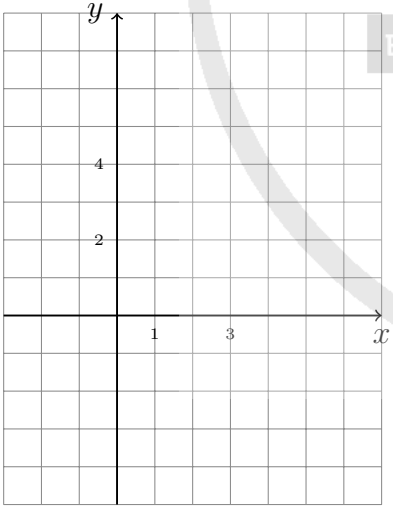

3. Graph the function $f(x) = \begin{cases} -x, & \text{if } x < 0 \\ 2, & \text{if } 0 \leq x \leq 2 \\ x, & \text{if } x > 2 \end{cases}$



4. Graph the function $f(x) = \begin{cases} x-2, & \text{if } x \geq 1 \\ -2x+2, & \text{if } x < 1 \end{cases}$




5. Graph the function $g(x) = \begin{cases} -\frac{1}{4}x-1, & \text{if } x < 4 \\ 2x-4, & \text{if } x \geq 4 \end{cases}$



# 5 - Problems

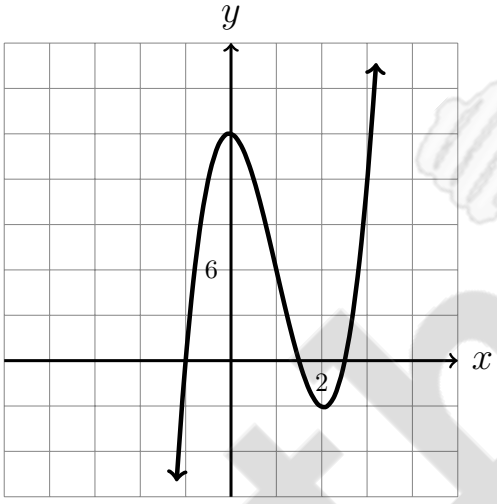
3. $\left[\diamond\text{🕷}^{10}_{26}\right]$ $[AY_{26}]$ The median of the list $n$, $n+3$, $n+4$, $n+5$, $n+6$, $n+8$, $n+10$, $n+12$, $n+15$ is 10. What is the mean? *(AMC10)*

4. $\left[\diamond\text{🕷}^{10}_{28}\right]$ $[AY_{28}]$ The sum of two numbers is $S$. Suppose 3 is added to each number and then each of the resulting numbers is doubled. What is the sum of the final two numbers? *(AMC10)*

# 6 - Rational Zeros

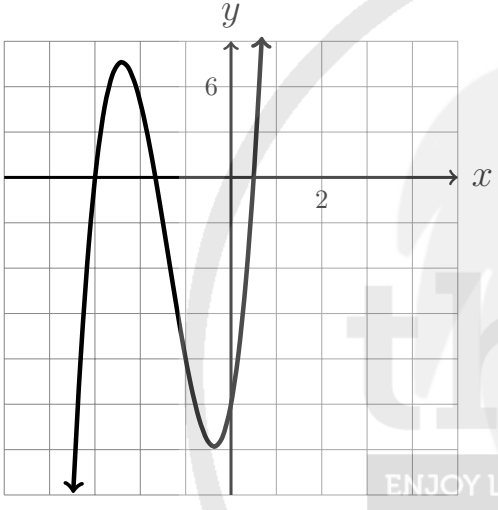
1. Use the graph to shorten the list of possible rational zeros of the function. Then find all real zeros of the function.

$f(x) = 4x^3 - 12x^2 - x + 15$



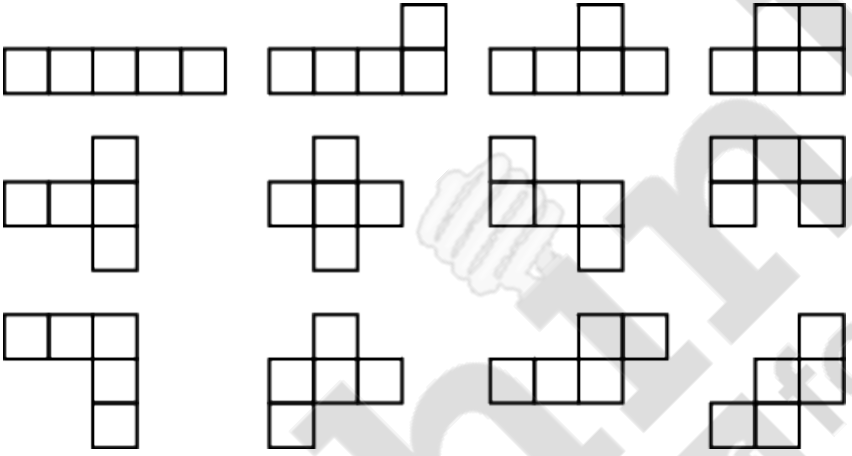
2. Use the graph to shorten the list of possible rational zeros of the function. Then find all real zeros of the function.

$$f(x) = 6x^3 + 25x^2 + 16x - 15$$



# 7 - Problems

5. $\left[\diamond\,{}^{10}_{30}\right]$ $[AY_{30}]$ How many of the twelve pentominoes pictured below have at least one line of symmetry? *(AMC10)*



6. $\left[\diamond^{10}_{41}\right]$ $[AY_{41}]$ The mean of three numbers is 10 more than the least of the numbers and 15 less than the greatest. The median of the three numbers is 5. What is their sum? *(AMC10)*

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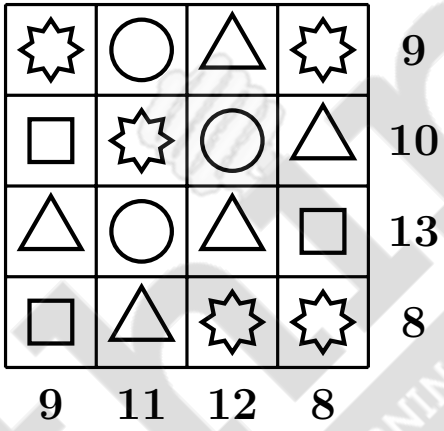
# 8 - Operations with Exponents

Simplify the expressions. Write your answer using only positive exponents. If a numeric base, then it should be a prime number.

- $(-8xy^9)^{-4} =$
- $\dfrac{1}{3x^6z^{-3}} =$
- $(-6ab^6)^{-3} =$
- $\dfrac{1}{8a^8c^{-7}} =$
- $\dfrac{1}{9x^3z^{-7}} =$
- $\dfrac{2x^5y^{-6}}{(3x^{-2}y^{-4})^8} =$
- $(-7c)^{-8} =$
- $(-8c)^{-9} =$

# 9 - Fun Time

Each of the different shapes below has a value. The numbers to the right of the grid are the sum of each row and the numbers in the bottom are the sum of each column. Can you work out the value of each shape? No shape has a value less than 1. Enter the solution into the empty grid.