$\qquad$

## Solving Non-Linear Systems Class Work

Objective: You will be able to solve and describe solutions to nonlinear systems.

When systems are non-linear (involving quadratics, cubic functions, etc.), the simplest method of solving is often by using a table of input-out values and/or visualizing solutions via graphing!

1. Determine how many solutions the system of equations will have. (Hint: Use your previous knowledge of functions to possibly sketch a graph.)

$$
\begin{aligned}
& y=x^{2}+3 \\
& y=-2
\end{aligned}
$$

2. Given the functions $m(x)=|x-3|+2$ and $n(x)=x^{2}+3$, determine the integer value(s) of $x$ for which $m(x)=n(x)$.

Using a table of values:
Graphing (you may use your calculator)
3. Determine the integer solution to $1 / 2|x+2|-4=x^{2}-19$.

You may use your calculator to graph, but also support your answer with a table of input and output values.
4. Given the functions $k(x)=1 / 2|3 x-5|$ and $j(x)=-x^{2}+5$, which intervals contain a value of $x$ for which $j(x)=k(x)$ ?
$\square-2 \leq x \leq-1$
$\square-1.5 \leq x \leq-0.5$
$\square-1 \leq x \leq 1$
$\square 0.5 \leq x \leq 1.5$
$\square 1.5 \leq x \leq 2.5$
$\square 3 \leq x \leq 4$
5. Given the functions $p(x)=-|4 x-3|$ and $q(x)=3 x^{2}-12$, which intervals contain a value of $x$ for which $p(x)=q(x)$ ?
$\square-9 \leq x \leq-7$
$\square-4 \leq x \leq-3$
$\square-1.5 \leq x \leq-0.5$
$\square 0.5 \leq \mathrm{x} \leq 1$
$\square 1 \leq \mathrm{x} \leq 1.3$
$\square 1.3 \leq x \leq 2$
6. Functions $g$ and $h$ are defined below. The graphs of $y=g(x)$ and $y=h(x)$ intersect at point $P$.

$$
g(x)=\frac{3}{x} \quad h(x)=\frac{x^{2}}{2}
$$

Determine the x-coordinate of P . Round your answer to the nearest tenth.
7. Functions $h$ and $k$ are defined below.

The graphs of $y=h(x)$ and $y=k(x)$ intersect at point $P$.

$$
h(x)=\frac{5}{x} \quad k(x)=\frac{2 x^{2}}{3}
$$

Determine the x-coordinate of P . Round your answer to the nearest tenth.
$\qquad$
$\qquad$
8. For each system of equations, determine the number of solutions.

| System | No Points of <br> Intersection | One Point of <br> Intersection | Two Points of <br> Intersection |
| :--- | :---: | :---: | :---: |
| $y=3-x^{2}$ <br> $y=3$ | $\square$ | $\square$ | $\square$ |
| $y=3-x^{2}$ <br> $y=2-x$ | $\square$ | $\square$ | $\square$ |
| $y=3-x^{2}$ <br> $y=5-x$ | $\square$ | $\square$ | $\square$ |

9. Without using your calculator, determine how many points of intersection will occur between the functions $y=3 x^{2}+1$ and $y=9$. Explain.
10. Functions $r$ and $s$ are defined below.

The graphs of $y=r(x)$ and $y=s(x)$ intersect at point $P$.

$$
r(x)=\frac{4}{x^{2}} \quad h(x)=-x^{2}
$$

Determine the x-coordinate of P. Round your answer to the nearest tenth.
11. Given the functions $f(x)=(-x)^{3}-2$ and $g(x)=7-x$, which interval(s) contain a value of $x$ for which $f(x)=g(x)$ ?
$\square-7 \leq x \leq-6$
$\square-2.5 \leq x \leq-1.5$
$\square 0.5 \leq \mathrm{x} \leq 1.5$
$\square 0.5 \leq x \leq 1$
$\square 6 \leq x \leq 7$
$\square 9 \leq x \leq 10$

## Exit Ticket:

1. Given the functions $w(x)=|x-4|$ and $v(x)=x^{2}-2$, determine the integer value(s) of $x$ for which $w(x)=v(x)$. Describe two ways to determine the solution, as well as what the solution represents.
2. Write any questions you still have regarding solving non-linear systems.
3. Create and solve any non-linear system problem that could be solved using the ideas we worked with today.
