The solution to $\mathbf{x}' = \begin{bmatrix} -2 & 0 \\ 21 & 5 \end{bmatrix} \mathbf{x}$ is $\mathbf{x} = c_1 \begin{bmatrix} 0 \\ 1 \end{bmatrix} e^{5t} + c_2 \begin{bmatrix} -1 \\ 3 \end{bmatrix} e^{-2t}$

Answer the following questions for $A = \begin{bmatrix} -2 & 0 \\ 21 & 5 \end{bmatrix}$:

The smaller eigenvalue of A is $r_1 =$ ____. An eigenvector corresponding to r_1 is $\mathbf{v} =$

The larger eigenvalue of A is $r_2 =$ ____. An eigenvector corresponding to r_2 is $\mathbf{w} =$

The general solution to $\mathbf{x}' = A\mathbf{x}$ is

For large **positive** values of t which is larger: $e^{r_1 t}$ or $e^{r_2 t}$?

For the following problems, consider the case when $c_1 \neq 0$ and $c_2 \neq 0$ where the general solution is $\mathbf{x} = c_1 \begin{bmatrix} v_1 \\ v_2 \end{bmatrix} e^{r_1 t} + c_2 \begin{bmatrix} w_1 \\ w_2 \end{bmatrix} e^{r_2 t}$,

For large **positive** values of t, which term dominates: $c_1 \begin{bmatrix} v_1 \\ v_2 \end{bmatrix} e^{r_1 t}$ or $c_2 \begin{bmatrix} w_1 \\ w_2 \end{bmatrix} e^{r_2 t}$?

Thus for large **positive** values of t, such trajectories (where $c_1 c_2 \neq 0$) when projected into the x_1, x_2 plane exhibit the following behavior (select all that apply):

* moves away from the origin.
* moves toward the origin.
* approaches the line $y = mx$ with slope $m =$ ______________
* approaches a line $y = mx + b$ for $b \neq 0$ with slope $m =$ ______________. Note this case corresponds to where both $||c_1\mathbf{v}||e^{r_1 t}$ and $||c_2\mathbf{w}||e^{r_2 t}$ are large, but one is significantly larger than the other.

For large **negative** values of t which is larger: $e^{r_1 t}$ or $e^{r_2 t}$?

For large **negative** values of t, which term dominates: $c_1 \begin{bmatrix} v_1 \\ v_2 \end{bmatrix} e^{r_1 t}$ or $c_2 \begin{bmatrix} w_1 \\ w_2 \end{bmatrix} e^{r_2 t}$?

Thus for large **negative** values of t, such trajectories (where $c_1 c_2 \neq 0$) when projected into the x_1, x_2 plane exhibit the following behavior (select all that apply):

* moves away from the origin.
* moves toward the origin.
* approaches the line $y = mx$ with slope $m =$ ______________
* approaches a line $y = mx + b$ for $b \neq 0$ with slope $m =$ ______________. Note this case corresponds to where both $||c_1\mathbf{v}||e^{r_1 t}$ and $||c_2\mathbf{w}||e^{r_2 t}$ are large, but one is significantly larger than the other.

the solution to $\mathbf{x}' = \begin{bmatrix} -2 & 0 \\ -9 & -5 \end{bmatrix} \mathbf{x}$ is $\mathbf{x} = c_1 \begin{bmatrix} 0 \\ 1 \end{bmatrix} e^{-5t} + c_2 \begin{bmatrix} -1 \\ 3 \end{bmatrix} e^{-2t}$

Answer the following questions for $A = \begin{bmatrix} -2 & 0 \\ -9 & -5 \end{bmatrix}$:

The smaller eigenvalue of A is $r_1 =$ ____. An eigenvector corresponding to r_1 is $\mathbf{v} =$

The larger eigenvalue of A is $r_2 =$ ____. An eigenvector corresponding to r_2 is $\mathbf{w} =$

The general solution to $\mathbf{x}' = A\mathbf{x}$ is

For large **positive** values of t which is larger: $e^{r_1 t}$ or $e^{r_2 t}$?

For the following problems, consider the case when $c_1 \neq 0$ and $c_2 \neq 0$ where the general solution is $\mathbf{x} = c_1 \begin{bmatrix} v_1 \\ v_2 \end{bmatrix} e^{r_1 t} + c_2 \begin{bmatrix} w_1 \\ w_2 \end{bmatrix} e^{r_2 t}$,

For large **positive** values of t, which term dominates: $c_1 \begin{bmatrix} v_1 \\ v_2 \end{bmatrix} e^{r_1 t}$ or $c_2 \begin{bmatrix} w_1 \\ w_2 \end{bmatrix} e^{r_2 t}$?

Thus for large **positive** values of t, such trajectories (where $c_1 c_2 \neq 0$) when projected into the x_1, x_2 plane exhibit the following behavior (select all that apply):

* moves away from the origin.
* moves toward the origin.
* approaches the line $y = mx$ with slope $m =$ ______________
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the solution to $\mathbf{x}' = \begin{bmatrix} 2 & 0 \\ 9 & 5 \end{bmatrix} \mathbf{x}$ is $\mathbf{x} = c_1 \begin{bmatrix} 0 \\ 1 \end{bmatrix} e^{5t} + c_2 \begin{bmatrix} -1 \\ 3 \end{bmatrix} e^{2t}$

Answer the following questions for $A = \begin{bmatrix} 2 & 0 \\ 9 & 5 \end{bmatrix}$:

The smaller eigenvalue of A is $r_1 =$ ____. An eigenvector corresponding to r_1 is $\mathbf{v} =$

The larger eigenvalue of A is $r_2 =$ ____. An eigenvector corresponding to r_2 is $\mathbf{w} =$

The general solution to $\mathbf{x}' = A\mathbf{x}$ is

For large **positive** values of t which is larger: $e^{r_1 t}$ or $e^{r_2 t}$?

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For large **positive** values of t, which term dominates: $c_1 \begin{bmatrix} v_1 \\ v_2 \end{bmatrix} e^{r_1 t}$ or $c_2 \begin{bmatrix} w_1 \\ w_2 \end{bmatrix} e^{r_2 t}$?

Thus for large **positive** values of t, such trajectories (where $c_1 c_2 \neq 0$) when projected into the x_1, x_2 plane exhibit the following behavior (select all that apply):

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For large **negative** values of t which is larger: $e^{r_1 t}$ or $e^{r_2 t}$?

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Thus for large **negative** values of t, such trajectories (where $c_1 c_2 \neq 0$) when projected into the x_1, x_2 plane exhibit the following behavior (select all that apply):

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