CHAPTER 12

Exercises 12

\( \mu \leq 7 \leq x \)

\( \frac{\mu x(x^{\alpha+\beta})f_x^{\alpha} (\alpha x - \alpha \gamma)}{\mu x(x^{\alpha+\beta})f_x^{\alpha} (\alpha x - \alpha \gamma)} = \mu \)

\( \text{where } \mu x(x^{\alpha+\beta})f_x^{\alpha} (\alpha x - \alpha \gamma) \leq \mu \)

\( \text{of real zeros of } \mu x(x^{\alpha+\beta})f_x^{\alpha} (\alpha x - \alpha \gamma) \leq \mu \)

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\( \text{where } \mu x(x^{\alpha+\beta})f_x^{\alpha} (\alpha x - \alpha \gamma) \leq \mu \)

\( \text{of real zeros of } \mu x(x^{\alpha+\beta})f_x^{\alpha} (\alpha x - \alpha \gamma) \leq \mu \)
13. Asymptotically stable improper node

15. Unstable saddle point

17. Unstable saddle point

19. Asymptotically stable improper node

27. Eigenvalues $3, -1$ correspond to eigenvectors $[3]^{T}$ and $[1 2]^{T}$ respectively. Solution rays on $y = 2x$ to infinity; solution rays on $y = 2x$ approach this.

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1. Unstable saddle point  
3. Unstable improper node  
5. Center or spiral point of indeterminate stability  
7. Unstable saddle point  
9. $(8, 2)$ is an asymptotically stable improper node; $(-8, -2)$ is an unstable saddle point.  
11. $(2, -2)$ is an unstable improper node; $(3, -3)$ is an unstable saddle point.  
13. Critical points $x = (2n + 1)\pi/2, x' = 0$ are unstable saddles for all odd $n$, inconclusive for even $n$.  
15. $x = x' = 0$ is an unstable spiral.  
17. $(1, 1)$ is an asymptotically stable improper node, proper node, or spiral point; $(-1, -1)$ is an unstable saddle point. (See Figure B.50.)

19. $(0, 0)$ is an unstable improper node, proper node, or spiral point; $(0, 3)$ and $(3, 0)$ are unstable saddle and $(2, 2)$ is an asymptotically stable improper node. (See Figure B.51.)
Figure B.55

\[ \varepsilon(\varepsilon/1) - \varepsilon(\varepsilon/1) + \varepsilon(\varepsilon/1) = (a \cdot x)^E \]

\[ \varepsilon^2 + \varepsilon(\varepsilon/1) - \varepsilon(\varepsilon/1) = (a \cdot y)^E \]

\[ |x - 1| \cdot |y + x| + \varepsilon(\varepsilon/1) + \varepsilon(\varepsilon/1) = (a \cdot x)^E \]

\[ x + \varepsilon(\varepsilon/1) - \varepsilon(\varepsilon/1) + \varepsilon(\varepsilon/1) = (a \cdot x)^E \]

\[ x + \varepsilon(\varepsilon/1) - \varepsilon(\varepsilon/1) - \varepsilon(\varepsilon/1) = (a \cdot x)^E \]

\[ (x) \cdot (x) = (x) \cdot (x) \]

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Figure B.54

Exercise 12.5, page 47

Figure B.53

\[ y = \frac{1}{2} \]

There are no critical points; species 0. Species of interest are all species x except for 0.

Exercise B.56

\[ y = \frac{1}{2} \]

There are no critical points; species 0. Species of interest are all species x except for 0.

Exercise B.57

\[ y = \frac{1}{2} \]

There are no critical points; species 0. Species of interest are all species x except for 0.

Exercise B.58

\[ y = \frac{1}{2} \]

There are no critical points; species 0. Species of interest are all species x except for 0.

Exercise B.59

\[ y = \frac{1}{2} \]

There are no critical points; species 0. Species of interest are all species x except for 0.

Exercise B.60

\[ y = \frac{1}{2} \]

There are no critical points; species 0. Species of interest are all species x except for 0.

Exercise B.61

\[ y = \frac{1}{2} \]

There are no critical points; species 0. Species of interest are all species x except for 0.

Exercise B.62

\[ y = \frac{1}{2} \]

There are no critical points; species 0. Species of interest are all species x except for 0.

Exercise B.63

\[ y = \frac{1}{2} \]

There are no critical points; species 0. Species of interest are all species x except for 0.

Exercise B.64

\[ y = \frac{1}{2} \]

There are no critical points; species 0. Species of interest are all species x except for 0.