> Test Student Lecture 19 Activity Results for Test Student Account (6) Score for this attempt: 1 out of 1 Dashboard Submitted Mar 12 at 8:27am This attempt took 1 minute. Courses / 1 pts 1 Question 1 $\mathcal{L}_{\mathcal{R}}$ Groups Consider the second order differential operator *L*: Calendar $L(u)\equiv a(x,y)u_{xx}+2b(x,y)u_{xy}+c(x,y)u_{yy}.$ 固 $+d(x,y)u_x+e(x,y)u_y+f(x,y)u_y$ Inbox Its discriminant is $\delta(x,y) = ig(b(x,y)ig)^2 - a(x,y)c(x,y).$ Suppose $\delta(x,y)>0$ at (x,y). Which statement below is true? History **Correct!** Course • Operator L is hyperbolic at (x, y). Material Website Operator L is parabolic at (x, y). **(** Commons Operator L is elliptic at (x, y). 10 Help There is not enough information to determine the classification of operator L at (x, y)y). The classification is affected by coefficients d(x, y) and e(x, y). Resources Operator L is degenerate at (x, y). **Additional Comments:** / 0 pts 0 Question 2 Consider the second order differential operator *L*: $L(u)\equiv a(x,y)u_{xx}+2b(x,y)u_{xy}+c(x,y)u_{yy}.$ $+d(x,y)u_x+e(x,y)u_y+f(x,y)u_y$ Its discriminant is $\delta(x,y) = \bigl(b(x,y)\bigr)^2 - a(x,y)c(x,y)$. Suppose $\delta(x,y)=0$ at (x,y) and a(x,y), b(x,y) and c(x,y) are not all zeros. Which statement below is true? Operator L is hyperbolic at (x, y). Correct! • Operator L is parabolic at (x, y). Operator L is elliptic at (x, y). There is not enough information to determine the classification of operator L at (x, y)y). The classification is affected by coefficients d(x, y) and e(x, y). Operator L is degenerate at (x, y). **Additional Comments:** 0 / 0 pts **Question 3** Which of the following is true? Select all that apply. $igsquare \partial_xig(a(x,y)\partial_xuig)=a(x,y)\partial_x^2u$ Correct! extstyle extCorrect! $extstyle extstyle \partial_x ig(a(x,y) \partial_x u ig) ext{ and } \partial_x^2 ig(a(x,y) u ig) ext{ have the same principal part.}$ $igcup a(x,y)\partial_x^2 u = \partial_x^2ig(a(x,y)uig)$ **Additional Comments:** / 0 pts 0 **Question 4** Consider the second order differential operator *L*: $L(u)\equiv a(x,y)u_{xx}+2b(x,y)u_{xy}+c(x,y)u_{yy}$ $+d(x,y)u_x+e(x,y)u_y+f(x,y)u_y$ The coefficient matrix is $A(x,y)=egin{pmatrix} a(x,y) & b(x,y) \ b(x,y) & c(x,y) \end{pmatrix}$. Which of the following is true? Select all that apply. oxed The principal part of L(u) is $\left(egin{array}{c} \partial_x \ \partial_y \end{array}
ight) A(x,y) \left(egin{array}{c} \partial_x \ \partial_y \end{array}
ight) u.$ igcup The principal part of L(u) is $\left(egin{array}{c} \partial_x \ \partial_y \end{array}
ight)^T A(x,y) \left(egin{array}{c} \partial_x \ \partial_y \end{array}
ight) u.$ \square L(u) and $\begin{pmatrix} \partial_x \\ \partial_y \end{pmatrix} A(x,y) \begin{pmatrix} \partial_x \\ \partial_y \end{pmatrix} u$ have the same principal part. Correct! ightharpoonup L(u) and $\left(egin{array}{c} \partial_x \ \partial_u \end{array}
ight)^T A(x,y) \left(egin{array}{c} \partial_x \ \partial_u \end{array}
ight) u$ have the same principal part. \Box L(u) and $A(x,y) \left(egin{array}{c} \partial_x \ \partial_y \end{array}
ight)^T \left(egin{array}{c} \partial_x \ \partial_y \end{array}
ight) u$ have the same principal part. \square L(u) and $\binom{\partial_x}{\partial_u}^T\binom{\partial_x}{\partial_u}\left(A(x,y)u\right)$ have the same principal part. **Additional Comments:** / 0 pts 0 **Question 5** Consider the second order differential operator L(u) with coefficient matrix A(x,y). L(u) and $\begin{pmatrix} \partial_x \\ \partial_u \end{pmatrix}^T A(x,y) \begin{pmatrix} \partial_x \\ \partial_u \end{pmatrix} u$ have the same principal part. Consider the change of variable $\begin{cases} \xi = \xi(x,y) \\ n = n(x,y) \end{cases}$. We have $\left(egin{array}{c} \partial_x \ \partial_y \end{array}
ight) u = \left(egin{array}{cc} \xi_x & \eta_x \ \xi_y & \eta_y \end{array}
ight) \left(egin{array}{c} \partial_\xi \ \partial_n \end{array}
ight) u = \left(rac{\partial (\xi,\eta)}{\partial (x,y)}
ight)^T \left(rac{\partial_\xi}{\partial_n}
ight) u$ Let $ilde{L}(u)$ denote operator L(u) in terms of new variables (ξ,η) . What is the coefficient matrix of $ilde{L}(u)$? igcirc $ilde{A}(\xi,\eta)=A(x,y)$ $ilde{A}(\xi,\eta) = \left(rac{\partial(\xi,\eta)}{\partial(x,y)}
ight)^T A(x,y) rac{\partial(\xi,\eta)}{\partial(x,y)}$ **Correct!** $ilde{oldsymbol{artheta}} ilde{A}(\xi,\eta) = rac{\partial(\xi,\eta)}{\partial(x,y)} A(x,y) igg(rac{\partial(\xi,\eta)}{\partial(x,y)}igg)^T$ $\circ \; ilde{A}(\xi,\eta) = A(x,y) igg(rac{\partial(\xi,\eta)}{\partial(x,y)}igg)^T$ $ilde{Q} ilde{A}(\xi,\eta) = rac{\partial(\xi,\eta)}{\partial(x,y)} A(x,y)$ $ilde{A}(\xi,\eta)$ is affected by the first derivative terms in L(u). There is not enough information to determine $ilde{A}(\xi,\eta)$ **Additional Comments:** 0 / 0 pts **Question 6** Consider the second order differential operator L(u) with coefficient matrix A(x,y). Consider the change of variable $\left\{egin{array}{l} \xi=\xi(x,y) \ \eta=\eta(x,y) \end{array}
ight.$ with non-singular Jacobian $\frac{\partial(\xi,\eta)}{\partial(x,y)}$. Let $\tilde{L}(u)$ denote operator L(u) in terms of new variables (ξ,η) . Which statement below is true? $\tilde{L}(u)$ and L(u) have the same coefficient matrix. Correct! ullet $ilde{L}(u)$ and L(u) have the same classification. $ilde{L}(u)$ and L(u) have the same classification only if the non-singular Jacobian $\frac{\partial(\xi,\eta)}{\partial(x,y)}$ is an orthogonal matrix. $ilde{L}(u)$ and L(u) have the same classification only if the non-singular Jacobian $\frac{\partial(\xi,\eta)}{\partial(x,y)}$ is a positive definite matrix. \cap $ilde{L}(u)$ and L(u) have the same classification only if $\det\left(rac{\partial(\xi,\eta)}{\partial(x,u)}
ight)>0.$ $ilde{L}(u)$ and L(u) have the same classification only if the non-singular Jacobian $\frac{\partial(\xi,\eta)}{\partial(x,y)}$ is a diagonal matrix. **Additional Comments:** 0 / 0 pts **Question 7** Consider the second order differential operator *L*: $L(u)\equiv a(x,y)u_{xx}+2b(x,y)u_{xy}+c(x,y)u_{yy}.$ $+d(x,y)u_x+e(x,y)u_y+f(x,y)u_y$ Suppose $\delta(x,y) = -\det \left(egin{array}{cc} a(x,y) & b(x,y) \ b(x,y) & c(x,y) \end{array}
ight) > 0$ in a region of (x, y). What is the coefficient matrix of the canonical form? $\circ \; ilde{A}(\xi,\eta) = lpha(\xi,\eta) \left(egin{matrix} 1 & 0 \ 0 & -1 \end{matrix}
ight)$ **Correct!** $ilde{oldsymbol{\circ}} \; ilde{A}(\xi,\eta) = lpha(\xi,\eta) \left(egin{array}{cc} 0 & rac{1}{2} \ rac{1}{2} & 0 \end{array}
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ight)$ $ilde{A}(\xi,\eta) = lpha(\xi,\eta) \left(egin{array}{cc} 1 & 0 \ 0 & 0 \end{array}
ight)$ \circ $ilde{A}(\xi,\eta)=lpha(\xi,\eta)\left(egin{matrix}1&0\0&1\end{matrix}
ight)$ **Additional Comments:** 0 / 0 pts **Question 8** Consider the second order differential operator *L*: $L(u)\equiv a(x,y)u_{xx}+2b(x,y)u_{xy}+c(x,y)u_{yy}.$ $+d(x,y)u_x+e(x,y)u_y+f(x,y)u_y$ Suppose $\delta(x,y) = -\det \left(egin{array}{cc} a(x,y) & b(x,y) \ b(x,y) & c(x,y) \end{array}
ight) < 0$ in a region of (x, y). What is the coefficient matrix of the canonical form? $\circ \; ilde{A}(\xi,\eta) = lpha(\xi,\eta) \left(egin{matrix} 1 & 0 \ 0 & -1 \end{matrix}
ight)$ $ilde{A}(\xi,\eta) = lpha(\xi,\eta) \left(egin{array}{cc} 0 & rac{1}{2} \ rac{1}{2} & 0 \end{array}
ight)$ $ilde{A}(\xi,\eta) = lpha(\xi,\eta) \left(egin{array}{cc} 0 & rac{-1}{2} \ rac{1}{2} & 0 \end{array}
ight)$ $\circ \; ilde{A}(\xi,\eta) = lpha(\xi,\eta) \left(egin{matrix} 1 & 0 \ 0 & 0 \end{matrix}
ight)$ **Correct!** $ilde{oldsymbol{artheta}} ilde{A}(\xi,\eta) = lpha(\xi,\eta) \left(egin{matrix} 1 & 0 \ 0 & 1 \end{matrix}
ight).$ **Additional Comments:** Fudge Points: You can manually adjust the score by adding positive or negative points to this box. **Update Scores** Final Score: 1 out of 1 Here's the latest quiz results for Test Student. You can modify the points for any question and add more comments, then click "Update Scores" at the bottom of the page. **Quiz Submissions** Attempt 1: 1 Test Student has 1 attempt left Allow this student an extra attempt ← Back to Quiz

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