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Birzeit University
Mathematics Department
Math332
Quiz 5

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Name:.....
Section:

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Number:.....
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Question I [10 points].

a. Classify the following PDE

$$u_{xx} + 4xu_{xy} = u_y.$$

b. Solve the following PDE

$$u_{xy} = 2 \cos 2y + \frac{1}{1+x^2}, \quad u_x(x, \pi) = \frac{2\pi}{1+x^2}, \quad u(0, y) = y.$$

$$a) \Delta = B^2 - 4AC = 16x^2 - 4(0) = 16x^2$$

2 Hyperbolic if $x \neq 0$ and parabolic if $x = 0$.

b) Integrate both sides w.r. to y :

$$2 \quad u_x = \sin 2y + \frac{y}{1+x^2} + g(x)$$

$$u_x(x, \pi) = \frac{\pi}{1+x^2} + g(x) = \frac{2\pi}{1+x^2}$$

$$1 \Rightarrow g(x) = \frac{\pi}{1+x^2}$$

$$\therefore u_x(x, y) = \sin 2y + \frac{y + \pi}{1+x^2}$$

2 Integrate w.r. to x ,

$$u(x, y) = x \sin(2y) + (y + \pi) \tan^{-1} x + h(y)$$

$$1 \quad u(0, y) = h(y) = y \Rightarrow u = x \sin 2y + (y + \pi) \tan^{-1} x + y$$

Good Luck

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