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5. F5.

5(a)

1/1 point (graded)

We want to model motion that is not diffusive. Instead all movement tends in one direction, like traffic in one direction along a highway.

The partial differential equation that models this situation is called the transport equation.

$$\frac{\partial u}{\partial t} + c \frac{\partial u}{\partial x} = 0, \quad c > 0.$$

Suppose that the initial condition is $u(x, 0) = f(x)$. Which of the following are solutions to the partial differential equation? (Choose all that apply.)

☐ $f(x + ct)$

☒ $f(x - ct)$

☐ $f(x + ct) + f(x - ct)$



☐ $f(x) e^{-ct}$



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You have used 1 of 3 attempts

✓ Correct (1/1 point)

5(b)

2/2 points (graded)

Use separation of variables $u(x, t) = v(x) w(t)$ to solve the transport equation for $c = 1$

$$\frac{\partial u}{\partial t} + \frac{\partial u}{\partial x} = 0.$$

Note that in this case, you will find that you can find eigenfunctions for λ any real number. Type **lambda** for λ in your answers. Enter eigenfunctions such that $v(0) = w(0) = 1$.

$$v(x) = \boxed{e^{(-\text{lambda}*x)}} \quad \checkmark$$

$$w(t) = \boxed{e^{(\text{lambda}*t)}} \quad \checkmark$$

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You have used 1 of 3 attempts

✓ Correct (2/2 points)



