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.

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

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.)

- [ ] $f(x + ct)$
- [x] $f(x - ct)$
- [ ] $f(x + ct) + f(x - ct)$

$f(x)\, e^{-ct}$

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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 eigenfuctions such that $v(0) = w(0) = 1.$

$v(x) =$ e^(-lambda*x)

$w(t) =$ e^(lambda*t)

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Correct (2/2 points)