

Problem Set 6: Extra Problems

1. Consider a long insulated rod lying along the x -axis. Let $f(x, t)$ be the function giving the temperature of the rod at the point x at time t . It is known that f satisfies the *partial differential equation*

$$\frac{\partial f}{\partial t} = k \frac{\partial^2 f}{\partial x^2};$$

here k is a constant depending on the material of the rod. Verify that the function

$$f(x, t) = e^{-kt} \sin x$$

satisfies this partial differential equation. Verify that the function

$$f(x, t) = e^{-4kt} \sin(2x)$$

satisfies it as well.

2. Find the point at which the tangent plane to the surface

$$z = x^2 + 2xy + 2y - 6x + 8y$$

is horizontal (i.e., parallel to the xy -plane).