

Math 560
Fall 2005
Homework 11
Assigned Monday, 28 November, 2005

1. (Page 145, # 7) Let $F(x, y, z) = 0$. Prove that

$$\frac{\partial z}{\partial y} \Big|_x \frac{\partial y}{\partial x} \Big|_z \frac{\partial x}{\partial z} \Big|_y = -1$$

2. (Page 146, #9) Let $z = f(xy)$. Show that this obeys the differential relation

$$x \left(\frac{\partial z}{\partial x} \right) - y \left(\frac{\partial z}{\partial y} \right) = 0$$

3. (Page 146, #13) If $z = F(ax + by)$ then

$$b \left(\frac{\partial z}{\partial x} \right) - a \left(\frac{\partial z}{\partial y} \right) = 0$$

4. (Page 146, #14) If $F(x - ct) + G(x + ct)$ then

$$c^2 \frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$$

5. (Page 146, #21) Let f be a function of class C^1 with $f(1, 1) = 1$, $f_1(1, 1) = a$ and $f_2(1, 1) = b$. Let $\varphi(x) = f(x, f(x, x))$. Find $\varphi(1)$ and $\varphi'(1)$.