

14.3, number 27: **Find** f_x , f_y , **and** f_z , **for** $f(x, y, z) = \arcsin(xyz)$.

Answer: Recall that the derivative of $\arcsin x$ with respect to x is $\frac{1}{\sqrt{1-x^2}}$. (Maybe you know this; or maybe you look it up; or maybe you say “Let $y = \arcsin x$.” This means $\sin y = x$. Now use implicit differentiation to find $\frac{dy}{dx}$. The only sneaky thing left is that you want to write your answer to $\frac{dy}{dx}$ in terms of x (rather than y). If this last approach amuses you, we can talk about it.)

At any rate

$$f_x = \frac{yz}{\sqrt{1-(xyz)^2}}, \quad f_y = \frac{xz}{\sqrt{1-(xyz)^2}}, \quad \text{and} \quad f_z = \frac{xy}{\sqrt{1-(xyz)^2}}.$$