

Math 13: Written Homework # 4
Due April 23 at 5pm

Please make sure your homework is stapled, if necessary before handing it in. Do not use paper clips or any variation of folding techniques to connect papers.

Solutions should be justified in a rigorous way. If you are unsure how much work to show, you can ask me prior to turning in your assignment.

- (1) (Problem #66, Chapter 12.5) Find parametric equations for the line through the point $(0, 1, 2)$ that is perpendicular to the line $x - 1 + t, y = 1 - t, z = 2t$ and intersects this line.
- (2) (Problem #50, Chapter 12.3) A tow truck drags a stalled car along a road. The chain makes an angle of 30° with the road and tension in the chain is 1500 N. How much work is done by the truck in pulling the car 1 km?
- (3) (Problem #48, Chapter 12.3) Suppose that \mathbf{a} and \mathbf{b} are nonzero.
 - (a) Under what circumstances is $\text{comp}_{\mathbf{a}}\mathbf{b} = \text{comp}_{\mathbf{b}}\mathbf{a}$?
 - (b) Under what circumstances is $\text{proj}_{\mathbf{a}}\mathbf{b} = \text{proj}_{\mathbf{b}}\mathbf{a}$?
- (4) (Problem #72, Chapter 14.3) If $g(x, y, z) = \sqrt{1 + xz} + \sqrt{1 - xy}$, find g_{xyz} . (The book's hint: use a different order of the differentiation for each term if you want to keep calculations simple.)
- (5) Suppose you need to know an equation for the tangent plane to a surface S at the point $P(1, 2, 3)$. You do not have an equation for S but you know that the curves $\mathbf{r}_1(t) = \langle 1 + 3t, 2 - t^2, 3 - 4t - t^2 \rangle$, $\mathbf{r}_2(u) = \langle 1 + u^2, 2u^3 + 2, 2u + 3 \rangle$ both lie on S . Find an equation of the tangent plane at P .
- (6) (Problem #62, Chapter 14.6) Show that the pyramids cut off from the first octant by any tangent planes to the surface $xyz = 1$ at points in the first octant must all have the same volume.