

## Problems: Equation of a Tangent Plane

Find the equation of the plane which is tangent to the surface  $x^3 + y^3 + z^3 = 32$  at the point  $(1, 2, 3)$ .

**Answer:** : Let  $w = x^3 + y^3 + z^3$ . We're interested in the surface  $w = 32$ .

The vector  $\nabla w = \langle 3x^2, 3y^2, 3z^2 \rangle$  is normal to this surface, so the normal vector at  $(1, 2, 3)$  is  $\langle 3, 12, 27 \rangle$ .

Applying point normal form for the equation of a plane tells us that:

$$3(x - 1) + 12(y - 2) + 27(z - 3) = 0 \quad \text{or} \quad 3x + 12 + 27z = 108$$

is the equation of the tangent plane to  $x^3 + y^3 + z^3 = 32$  at  $(1, 2, 3)$ .

MIT OpenCourseWare  
<http://ocw.mit.edu>

18.02SC Multivariable Calculus  
Fall 2010

For information about citing these materials or our Terms of Use, visit: <http://ocw.mit.edu/terms>.