

## SPRING 26 - CALCULUS 3 - EXAM 3A (CH 15) - Solutions

No references. True or false...polar coordinates are  $(r, \theta)$ , cartesian coordinates are  $(x, y, z)$ , cylindrical coordinates are  $(r, \theta, z)$  and spherical coordinates are  $(\rho, \theta, \phi)$ . Assume all integrals exist.

F 1)  $\frac{\partial(r, \theta)}{\partial(x, y)} = r$

F 2)  $\frac{\partial(r, \theta, z)}{\partial(x, y, z)} = r$

T 3)  $\frac{\partial(x, y, z)}{\partial(\rho, \theta, \phi)} = \rho^2 \sin \phi$

F 4)  $\frac{\partial(x, y, z)}{\partial(r, \theta, z)} = r^{-1}$

T 5) There are six different ways to write the same triple integral

F 6)  $\int_a^b \int_c^d f(x, y) dx dy = \int_a^b \int_c^d f(x, y) dy dx$

T 7)  $\int_y \int_x f(x, y) dx dy = \int_\theta \int_r f(x(r, \theta), y(r, \theta)) r dr d\theta$

F 8) In polar coordinates  $x = r \cos \phi$

F 9) In spherical coordinaters  $z = \rho \cos \theta$

F 10)  $\rho = r$

T 11) The equation of a cylinder in cylindrical coordinates could be  $r = a$ , some constant

F 12) The equation of a sphere in spherical coordinates could be  $r = a$ , some constant

F 13) The centroid and the center of gravity never coincide if density is not constant

F 14) The centroid of a figure depends on its density

F 15) The center of mass of a three dimensional body always lies on its axes of symmetry

F 16) The centroid and center of mass are the same thing

T 17)  $M_{xy}$  is the moment of the mass of an object relative to the  $xy$  plane

F 18)  $M_{yz}$  is the moment of inertia of a mass about the  $yz$  plane

T 19) Differential moment of inertia of a differential mass  $dm$  about the  $z$ -axis is  
 $dI = (x^2 + y^2) dm$

T 20) A rectangle has a higher moment of inertia around its shorter side than its longer side

T 21) Jacobians are local area or volume magnification factors for double or triple integrals

F 22) The equation of a paraboloid in cartesian coordinates could be  $x^2 + y^2 = z^2$

T 23)  $\iiint |f(x, y, z)| dx dy dz \geq \iiint f(x, y, z) dx dy dz$

T 24) Coordinate transformations must be bijective mappings

T 25) The polar moment of inertia  $I_0$  of a figure in the  $xy$  plane is the sum  $I_x + I_y$