FALL 24 - CALCULUS 3 - EXAM 4A - Solutions

No references. True or false...polar coordinates are (r,θ), cartesian coordinates are (x,y,z), cylindrical coordinates are (r,θ,z) and spherical coordinates are (ρ,θ,ϕ). 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) $\int_a^b \int_c^d f(x,y)dxdy = \int_a^b \int_c^d f(x,y)dydx$

T 7) $\int_y \int_x f(x,y)dxdy = \int_\theta \int_r f(x(r,\theta),y(r,\theta)rdrd\theta$

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) $\iiint |f(x,y,z)|dxdydz \geq \iiint f(x,y,z)dxdydz$

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 $I_x + I_y$