

Answers to Test 3, Spring 2001

1. (a) 1

(b) $\pi^3/6$

(c) $\frac{1}{6} \sin\left(\frac{\pi^3}{8}\right)$

2. $(r, \theta, z) = (\sqrt{2}, 7\pi/6, -\sqrt{2})$

$(\rho, \theta, \phi) = (2, 7\pi/6, 3\pi/4)$

Comment: To calculate ϕ , be sure to use $z = \rho \cos \phi$. Using $r = \rho \sin \phi$ causes problems. The point here is that $\cos \phi$ takes on different values for different ϕ with $0 \leq \phi \leq \pi$ and $\sin \phi$ does not.

3. 3

4. $\sqrt{2/5} = \sqrt{10}/5$

5. (a) $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{2-y^2}} dz dy dx = \int_0^1 \int_0^{\sqrt{1-y^2}} \int_0^{\sqrt{2-y^2}} dz dx dy$

(b) $\int_0^{\pi/2} \int_0^1 \int_0^{\sqrt{2-r^2 \sin^2 \theta}} r dz dr d\theta$

6. $\frac{4^{10}\pi}{10} = \frac{2^{19}\pi}{5} = \frac{524288\pi}{5}$