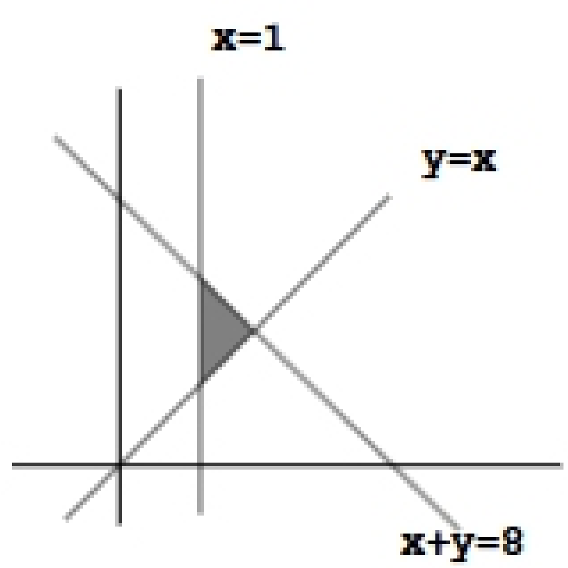
1. (a) True.
   (b) False. This would be true for e^{x+y}.
   (c) False. To be true the inside integral needs to start at $z=0$ not $z=1$.
   (d) True
   (e) True. When using the values of θ, the only requirement is that the starting value and ending value can not have a difference of more than 2π.
2. (a) $x^2+y^2=6y$ this is a circle.
   (b) $\rho = 4\sec(\phi)$
   $\rho\cos\phi = 4$
   $z=4$ this is a plane
3. Note: Since $f(x,y)$ is not a constant function, the volume of each of the 5 solids formed with the base being the leaf and the height being $f(x,y)$ will not be equal.

   Note 2: you can not integrate from 0 to 2π since on parts of this interval the radius will be negative.

   I have set up the integral for the leaf that is centered on the positive x-axis.

   $$\int_{-\pi/10}^{\pi/10}\int_{0}^{\cos(5\theta)} 5r^3\cos^2\theta \; dr d\theta$$
4. Change the limits of the integral to get: $\displaystyle\int_0^3\int_0^{2y} e^{y^2}\; dxdy$.

   integrating this gives e^9-1
5. The correct region has been shaded in the graph.



$$\int_1^4\int_x^{8-x} \sqrt{3^2+5^2+1}\; dydx = \ldots = 9\sqrt{35}$$

6. The surface is given by $z=\sqrt{25-y^2}$ so we get $z_x=0$ and $z_y=\dfrac{-y}{\sqrt{25-y^2}}$

$$\int_0^3\int_0^{\sqrt{9-x^2}} \sqrt{\frac{y^2}{25-y^2}+1}\;\; dydx = \int_0^3\int_0^{\sqrt{9-x^2}} \sqrt{\frac{25}{25-y^2}}\;\; dydx$$

or $\displaystyle\int_0^{\pi/2}\int_0^3 r\sqrt{\frac{25}{25-r^2\sin^2\theta}}\;\; drd\theta$

7. First find the intersection of the sphere and the paraboloid.

   The paraboloid gives $z+5=x^2+y^2$ substituting this into the sphere equation gives $z+5+z^2=25$. Solving gives $z=4$ and $z=-5$. Since this is the top of the sphere $z=4$ is what we want.

   The intersection is $x^2+y^2+(4)^2=25$ or $x^2+y^2=9$

   Also note that $y \geq 0$ means that $0 \leq \theta \leq \pi$.

   $$\int_0^{\pi}\int_0^3\int_{r^2-5}^{\sqrt{25-r^2}} r\ dz dr d\theta$$

8. $$\int_0^4\int_0^{16-4y}\int_y^{(16-2y-z)/2} f(x,y,z)\ dx dz dy$$

9. (a) $$\int_0^{\pi}\int_0^3\int_r^{\sqrt{18-r^2}} zr^2\cos\theta\ \ dz dr d\theta$$

   (b) $$\int_0^{\pi}\int_0^{\pi/4}\int_0^{\sqrt{18}} \rho^4\sin^2\phi\cos\phi\cos\theta\ \ d\rho d\phi d\theta$$

10. $$\int_0^{2\pi}\int_3^6\int_1^{r\sin\theta+40} r^2\sin\theta\ \ dz dr d\theta$$

11. $$\int_{-\sqrt{3}}^{\sqrt{3}}\int_{4y^2}^{15-y^2} k((x-20)^2+y^2)\ dx dy$$