16.3

1. $F = < y\sin(yz), x\sin(yz) + xyz\cos(yz), xy^2\cos(yz) >$
$$P_y = Q_x = \sin(yz) + yz\cos(yz)$$
$$P_z = R_x = y^2\cos(yz)$$

$$Q_z = R_y = 2y\cos(yz) - xy^2z\sin(yz)$$

$$So, F \text{ is conservative and } \int_C Fdr = f(1,1,\pi) - f(0,0,0) = 0$$

3. $\nabla f = < f_x, f_y > = < 3,6y > \int_C Fdr = f(r(4)) - f(r(1)) = -\frac{9}{4}$

5. $\nabla f = (f_x, f_y, f_z) = (ye^z, xe^z, xye^z) \int Fdr = f(r(2)) - f(r(1)) = 32e - 1$

9. $P_y = Q_x = 2y \; P_z = R_x = 0 \; R_z = Q_y = e^z$
   $f = xy^2 + ye^z$

13. $P_y = Q_x = 0 \; P_z = R_x = \sec^2 x \; R_z = Q_y = 1$

   $f = z\tan(x) + yz$
15. $P_y = Q_x = 2x \; P_z = R_x = 0 \; Q_z = R_y = -4$
   $f = x^2y + 5x - 4yz$
17. $P_y = Q_x = 2xz \; P_z = R_x = 2xy \; Q_z = R_y = 0, \text{the vector field is conservative}$

   $f = x^2yz, \text{the intergral equals } f(4,1,1) - f\left(0,\frac{\sqrt{2}}{2},1\right) = 16$

19. $f(1,1,0) - f(0,0,0) = 1$
   $\int Fdr_1 = \int_0^1 3t^2dt = 1$

   $\int Fdr_2 = \int_0^1 4t^3dt = 1$