

### MAC2313 Review 4 Answer

1. (1)  $\operatorname{div} \vec{F} = 0$ ;  $\operatorname{curl} \vec{F} = \vec{0}$ ;  $\vec{F}$  is conservative and  $f(x, y, z) = xy + yz$   
(2)  $\operatorname{div} \vec{F} = 2(x^2 + 2)e^z - \sin(y)$ ;  $\operatorname{curl} \vec{F} = \vec{0}$ ;  $\vec{F}$  is conservative and  $f(x, y, z) = 2x^2e^z + \sin(y)$   
(3)  $\operatorname{div} \vec{F} = (1 + 2x)e^{2x} + e^{2y} + e^{2z}$ ;  $\operatorname{curl} \vec{F} = \langle 2ze^{2y} - 2ye^{2z}, 0, 0 \rangle$ ;  $\vec{F}$  is not conservative  
(4)  $\operatorname{div} \vec{F} = 2 - \frac{2xy}{(1 + x^2)^2}$ ;  $\operatorname{curl} \vec{F} = \vec{0}$ ;  $\vec{F}$  is conservative and  $f(x, y, z) = y \arctan(x) + z^2$
2. (1) negative      (2) positive
3. (1) 0      (2)  $\sqrt{5} \left( \frac{8}{3}\pi^3 + 2\pi \right)$       (3) -1      (4) 1/3      (5)  $-12\pi$
4. (1)  $32\sqrt{3}\pi$       (2)  $-\frac{64}{3}\pi$       (3)  $\frac{\pi}{2}$
5.  $3\pi$
6. (1)  $x + 4y + 4z = 0$       (2)  $\int_0^3 \int_{-3}^3 2\sqrt{u^4 + 4u^2v^2 + v^4} dv du$
7. No, since  $\operatorname{div}(\operatorname{curl} \vec{G}) \neq 0$
8. (1)  $\frac{1}{2}(3\pi - 9)$       (2)  $-\frac{3\pi}{4}$
9. (1) 4/3      (2) 4/3
10. (1)  $3(\cos(2) - 1)$       (2)  $-\frac{1712}{15}\pi$       (3)  $\pi$
11. False; false; true; true; false; false