

Math 302 – 02 Quiz 3

(A)

Name:.....Serial#:.....

---

**Q.1:** Let  $\mathbf{F}(t) = -(t + \sin(t))\mathbf{i} + \cos(2 + t)\mathbf{j} + 3t^2\mathbf{k}$ , and  $f(t) = -2t^2$ . Find  $\mathbf{F}(f(t))$  and use this to compute  $\frac{d}{dt}\mathbf{F}(f(t))$

**Q.2:** Let  $\varphi(x, y, z) = e^z \sin(y) \sin(z)$ . Find the gradient of  $\varphi$  and evaluate the gradient at  $\left(0, \frac{\pi}{4}, -\frac{\pi}{4}\right)$ . Also find the maximum and minimum rate of change  $\varphi$  at this point.

**Q.3:** Let  $\mathbf{A} = a\mathbf{i} + b\mathbf{j} + c\mathbf{k}$  be a constant vector and  $\mathbf{R} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ . Prove that divergence of  $3\mathbf{A} - 5\mathbf{R}$  is equal to  $-15$ .