Answer's to Math 241 Final, 1994

Part I:

(1) (a) $\langle -4, -3, 0\rangle$
(b) 7
(c) $\langle 3, -4, 5\rangle$
(d) 3

(2) $1/2$

(3) $-1/\sqrt{2}$

(4) (a) $(r, \theta, z) = (6, \pi/3, -2\sqrt{3})$
(b) $(\rho, \phi, \theta) = (4\sqrt{3}, 2\pi/3, \pi/3)$

(5) $x + y - z = 0$

(6) (a) $1/6$
(b) $\pi^3/6$

(7) Divergence is $3x$
Curl is $\langle 2y, 0, y\rangle$

(8) $(0, 2)$, local minimum
$(1, 1)$, saddle point
$(-1, 1)$, saddle point

Part II:

(1) (a) (a), planes parallel to the xz-plane
(b) (f), $(0, \pm 1/\sqrt{3}, 0)$

(2) (a) $8\pi/3$
(b) $\dfrac{4}{3}\big(1 - \cos(1)\big)$
(c) $\dfrac{2\pi}{9}\left(65^{3/2} - 1\right)$

(3) (a) Note that $3(1 + 2t) + (1 - 2t) - 4(3 + t) \neq 7$ for any t.
(b) Yes, in fact ℓ_2 lies on the plane $\mathcal{P}$. Why?
(c) $15/\sqrt{26}$

(4) $\big(\pm 1/\sqrt{2}, 0, -1/2\big)$