

Ord: \_\_\_\_\_

Calc III  
MAC3474 3129

Z-class

Prof. JLF King  
Touch: 4Aug2016

**Note.** If you find an unfamiliar term, look in the “End Notes and Hints” section at the end of this problem-sheet. Do **not** approx.: If your result is “ $\sin(\sqrt{\pi})$ ” then write that rather than  $.9797\ldots$ . Use “ $f(x)$  notation” when writing fncs; in particular, for trig and log fncs. E.g., write “ $\sin(x)$ ” rather than the horrible  $\sin x$  or  $[\sin x]$ . Write expressions unambiguously e.g., “ $1/a+b$ ” should be bracketed either  $[1/a] + b$  or  $1/[a+b]$ . (Be careful with **negative** signs!)

**Z4:** Show no work. Questions (a)–(b) refer to these three vectors/points in  $\mathbb{R}^3$ :

$$\mathbf{w} := (-2, 2, 1), \quad \mathbf{u} := (0, 2, 2), \\ \mathbf{a} := (0, 2, 1), \quad \mathbf{b} := (0, 1, 0).$$

**a** Let  $\mathbb{L}_0$  be the line passing through points **a** and **b**. Let  $\mathbb{L}_1$  be the line passing through points **u** and **w**. Compute the (orthogonal) distance between lines  $\mathbb{L}_0$  and  $\mathbb{L}_1$ .

$$\text{Dist}(\mathbb{L}_0, \mathbb{L}_1) = \underline{\hspace{10em}}$$

**b** Compute the (orthogonal) distance from the point **a** to the *plane* passing through **w**, **u** and **b**.

$$\text{Distance} = \underline{\hspace{10em}}$$

**c** Let  $\beta$  denote the *dihedral* angle of a regular octahedron. So  $\cos(\beta) = \underline{\hspace{10em}}$ .

**d** The planet Oilcan has two satellites, Munchkin and Gilligan, in circular orbit. The radius of Munchkin’s orbit is 8000 miles and her speed is 1500mph. Gilligan’s orbital radius is 50,000 miles. What is his speed?

$$\text{Speed} = \underline{\hspace{10em}} \text{ mph.}$$

**e** News Flash: 10th planet detected, in circular orbit around the sun, outside the orbit of Pluto. Yclept Blotto, this newly discovered planet has a year equaling 512 Earth-years. In astronomical units (1 a.u. is the radius of the Earth’s orbit) please compute  
[Radius of Blotto’s orbit] =  $\underline{\hspace{10em}}$  a.u..

**Notes and Hints.** There is a convenient way to place a regular octahedron in 3-space, using our  $\hat{i}, \hat{j}, \hat{k}$  vectors.. The dihedral angle at an edge of a polyhedron, is the angle between the two *faces* which meet at that edge.  $\square$

End of Z-class

**Z-home:** \_\_\_\_\_ 340pts

**Z4:** \_\_\_\_\_ 160pts

**Total:** \_\_\_\_\_ 500pts

**HONOR CODE:** “*I have neither requested nor received help on this exam other than from my professor (or his colleague).*”  
Name/Signature/Ord

Ord: \_\_\_\_\_

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