Mth 254 Test | **Name:** **ID:**

Bent Petersen `254winter2001_test.tex` Friday Feb 16, 2001 Time: 50 minutes.

Instructions: $\Longrightarrow$ If you do not read the instructions, then how will you know what to do? Read them now.

Be sure to write your name in the space above.

- *You may use one note-sheet prepared in advance. You must put your name on your note-sheet, but do not turn in your note-sheet. Your note-sheet must be letter size,* 8.5×11 *inches, or A4 paper,* 21×29.7 *cm, or smaller. You may write on both sides of your note-sheet.*
- *Note-sheets may not be shared. If you do not bring a note-sheet you will have to do without any help notes.*
- *You may not use any books, notebooks nor additional note-sheets.*
- *You may use a calculator. Calculators and other equipment may not be shared.*
- *For work-out problems sketch your work neatly. Highlight your answer by drawing a frame around it. Scratch out irrelevant or incorrect work so it will be clear what you are submitting as a solution. Give exact answers when possible. Simplify your answer when reasonable to do so. Partial credit will be assigned only for relevant, clear, correct, legible work. If you do not show some relevant work or explain your solution, your grade may be 0.*
- *For multiple-choice problems indicate your choice in the box provided. You need not show any work nor offer any explanations for your answer. If you need to do some work, you may do it in the space provided, if any, or on the back of the examination sheets, but your work will not be graded. You will be graded only on the letter you select to put in the box. Note this test does not use a scantron.*
- *Use the backs of the examination sheets for scratch work.*

Problem 1. *(25 points).* Find an equation of the plane through the points $(1, 4, 0)$, $(2, -1, 3)$ and $(3, 2, 2)$.

Problem 2. *(25 points).* Find the vector parametric equation of the line through the points $P_1 = (2, 4, 1)$ and $P_2 = (-4, 2, -3)$. Then find the point midway along the line from P_1 to P_2.

Problem 3. *(25 points).* Let

$$f(x, y) = x^2 - y^2x + x^3 - xy.$$

Find the gradient $\vec{\nabla} f$ of f at the point $(1, -1)$. Find the tangent plane to the graph of f at the point $(1, -1, 2)$.

Problem 4. *(25 points).* Find an expression in vector form for the point $\vec{r}_1$ of intersection of the plane $\vec{n}\cdot\vec{r} = d$ and the perpendicular line $\vec{r} = \vec{r}_0 + t\vec{n}$.

Problem 5. *(25 points).* Suppose $w = h(x(t), y(t))$ and

$$\frac{\partial h}{\partial x}(1,2) = 3, \quad \frac{\partial h}{\partial x}(2,1) = 5, \quad \frac{\partial h}{\partial y}(1,2) = 4, \quad \frac{\partial h}{\partial y}(2,1) = 6.$$

If $x(0) = 1$, $x'(0) = 2$, $y(0) = 2$ and $y'(0) = 1$ compute $w'(0)$. Here the prime indicates differentiation with respect to t, that is, $w' = \dfrac{dw}{dt}$.

Problem 6. *(25 points).* Two resistors with resistances x and y are wired in parallel. The effective resistance R is given by

$$\frac{1}{R} = \frac{1}{x} + \frac{1}{y}.$$

Suppose $x = 10$ ohms and $y = 15$ ohms. Estimate the change ΔR in R due to uncertainties Δx in x and Δy in y. If you want R to be fairly close to its theoretical value, on which resistor, x or y, would you spend a little extra for a high tolerance (that is, more accurate) resistor?

Additional test policies for this class are provided on my web page `http://ucs.orst.edu/~peterseb`.

Please do not write in the boxes to the right. They are for your grades.

Do not be concerned if there are more boxes than problems.

	Letter Grade ☐ *This test only* ☐ *Cummulative*

1	2	3	4	5	6	7	8	9	10	Total

Note: There are 6 problems for a total of 150 points.