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| Test 1 (Version  )Dusty Wilson Math 153 No work = no credit  No Symbolic Calculators | **Name:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  *I myself, a professional mathematician, on re-reading my own work find it strains my mental powers to recall to mind from the figures the meanings of the demonstrations, meanings which I myself originally put into the figures and the text from my mind. But when I attempt to remedy the obscurity of the material by putting in extra words, I see myself falling into the opposite fault of becoming chatty in something mathematical.*  Johannes Kepler (1597 - 1630)  German astronomer |

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| Warm-ups (1 pt each): | =\_\_\_\_\_ | =\_\_\_\_\_ | =\_\_\_\_\_ |

(1 pt) Based upon the quote above, how easily did Kepler understand his earlier work? Answer using complete English sentences.

(10 pts) Consider  and .

1. Find 
2. Find 
3. Find the angle between  and .
4. Find the vector parallel to with length 3.
5. Find 

(10 pts) Consider the plane 

1. (6 pts) Find the equation of the line that is normal to the plane through point .
2. (2 pts) Find the equation of *any* line that is on the plane
3. (2 pts) Find the distance from the plane to the point .

(10 pts) Find an equation of the plane that passes through the point (−1, 1, 3) and contains the vectors  and .

(6 pts) Consider the sphere with radius 3, centered at the point (0,1,2).

a.) (4 pts) Write the equation of the sphere.

b.) (2 pts) Carefully sketch the sphere.

(10 pts) Find the equation of the tangent line to the curve parameterized by  and  when .

(10 pts) Use techniques developed in this course to verify that the circumference of a circle with radius 5 is .

Hint: Begin by writing a parametric equation for a circle of radius 5 centered at the origin.

(10 pts) Set up an integral to find the area inside the circle , but outside the cardioid .

Note: You may evaluate the integral to verify the area is 