Math 20C Practice Midterm

August 2015

Problem 1 (10 points)

Part A (5 points)

Compute

$$\frac{\partial}{\partial x} e^{\sin(x^2+y^2)}$$

Part B (5 points)

Compute

$$\frac{\partial^2}{\partial x \partial y}(x^2 e^x - 6x^3 + y)\cos(x)$$

Problem 2 (12 points)

Consider the vector-valued function:

$$\boldsymbol{r}(t) = \left\langle \cos(3t),\ \sin(3t),\ \sqrt{7} \right\rangle$$

Part A (3 points)

Compute $\boldsymbol{r}'(t)$

Part B (3 points)

Compute $\boldsymbol{r}''(t)$

Part C (6 points)

Find the arc length of $\boldsymbol{r}(t)$ from $0 \leq t \leq 2\pi$.

Problem 3 (13 points)

Consider the plane P given by the equation $3x - 10y + 2z = 5$

Part A (3 points)

Find a normal vector for the plane P.

Part B (5 points)

Using the answer from Part A, find a parametrization of a line (in the form $\boldsymbol{c}(t) = p_0 + t\boldsymbol{v}$) that is perpendicular to the plane P.

Part C (5 points)

Using the answer from Part A, find a a parametrization of a line (in the form $\boldsymbol{c}(t) = p_0 + t\boldsymbol{v}$) that is contained in the plane P.

Problem 4 (8 points)

Let $\boldsymbol{u} = \langle 1,\ 5,\ 2\rangle$ and $\boldsymbol{v} = \langle 2, 1, -1\rangle$.

Part A (4 points)

Compute $\boldsymbol{u} \times \boldsymbol{v}$.

Part B (4 points)

Compute the projection of $\boldsymbol{u}$ onto $\boldsymbol{v}$.

Problem 5 (6 points)

Find a parametrization of the tangent line (in the form $\boldsymbol{c}(t) = p_0 + t\boldsymbol{v}$ to the curve:

$$\boldsymbol{c}(t) = \left\langle e^{2t},\ t^4 - 1,\ 5t\right\rangle$$

at the point $t = 2$