Name: ___________________________  Class Time: 1 day

Purpose: To review some old, but important, concepts/computations.

Procedure: Do the problems below and bring your solutions to class.

Problem 1. Find parameterizations $\mathbf{r}(t)$ along with correct domains for the variable $t$ for the following curves.

(a) The top half (where $y \geq 0$) of the circle $x^2 + y^2 = 9$ in $\mathbb{R}^2$, oriented counterclockwise.

(b) The right half (where $x \geq 0$) of the circle $x^2 + y^2 = 9$ in $\mathbb{R}^2$, oriented counterclockwise.

(c) The bottom half (where $y \leq 0$) of the circle $x^2 + y^2 = 9$ in $\mathbb{R}^2$, oriented clockwise.

(d) The right half (where $x \geq 0$) of the circle $x^2 + y^2 = 9$ in $\mathbb{R}^2$, oriented clockwise.

(e) The line segment from the point $(1, 4, 5)$ to the point $(3, -1, 0)$ in $\mathbb{R}^3$.

(f) The graph of $y = \ln(x)$ in $\mathbb{R}^2$, from the point $(1, 0)$ to the point $(e, 1)$.

(g) The graph of $y = \ln(x)$ in $\mathbb{R}^2$, from the point $(e, 1)$ to the point $(1, 0)$.

(h) The curve in $\mathbb{R}^3$ which is the intersection of the cylinder $x^2 + y^2 = 9$ and the plane $z = x + 2$.

Problem 2. Decide which of the vector fields $\mathbf{F}$ below are conservative. If $\mathbf{F}$ is conservative, also compute an associated potential function $f$ (so that $\nabla f = \mathbf{F}$).

(a) $\mathbf{F} = \langle 3xy, y^2 + x \rangle$ on $\mathbb{R}^2$

(b) $\mathbf{F} = \langle -2xe^{-x^2-y^2} (2x^2 + 3y^2 - 2), -2ye^{-x^2-y^2} (2x^2 + 3y^2 - 3) \rangle$ on $\mathbb{R}^2$

(c) $\mathbf{F} = \langle 12x^2 + 3yz, 3xz + 2yz, 3xy + y^2 \rangle$ on $\mathbb{R}^3$

(d) $\mathbf{F} = \langle 12x^2 + 3yz, 3xz + 2yz + 5, 3xy + y^2 \rangle$ on $\mathbb{R}^3$

(e) $\mathbf{F} = \langle 12x^2 + 3yz, 3xz + 2yz + 5x, 3xy + y^2 \rangle$ on $\mathbb{R}^3$