Box: _____(Name On Back)
Math 60: Section _____
Assignment 3
Due Date: 9/28/18

Section 3.1: 10, 17
Section 3.2: 1, 4, 13
Section 3.3: 24
Section 3.4: 4, 7, 12, 23

Section 3.1
Calculate the velocity, speed, and acceleration of the paths given in Exercises 7-10.
10. $\mathbf{x}(t) = (e^t, e^{2t}, 2e^t)$

In Exercises 15-18, find an equation for the line tangent to the given path at the indicated value for the parameter.
17. $\mathbf{x}(t) = (t^2, t^3, t^5), t = 2$

Section 3.2

Calculate the length of each of the paths given in Exercises 1-6.

1. $\mathbf{x}(t) = (2t + 1, 7 - 3t), -1 \leq t \leq 2$

Calculate the length of each of the paths given in Exercises 1-6.
4. $\mathbf{x}(t) = 7\mathbf{i} + t\mathbf{j} + t^2\mathbf{k}, 1 \leq t \leq 3$

13. This problem concerns the path $\mathbf{x} = |t-1|\mathbf{i} + |t|\mathbf{j}, 2 \leq t \leq 2$.

(a) Sketch this path.

(b) The path fails to be of class C^1 but is piecewise C^1. Explain.

(c) Calculate the length of the path.

Section 3.3

24. Consider the vector field $\mathbf{F} = 2x\mathbf{i} + 2y\mathbf{j} - 3\mathbf{k}$.

(a) Show that $\mathbf{F}$ is a gradient field.

(b) Describe the equipotential surfaces of $\mathbf{F}$ in words and with sketches.

Section 3.4

Calculate the divergence of the vector fields given in Exercises 1-6.

4. $\mathbf{F} = z\cos(e^{y^2})\mathbf{i} + x\sqrt{z^2+1}\mathbf{j} + e^{2y}\sin(3x)\mathbf{k}$

Find the curl of the vector fields given in Exercises 7-11.
7. $\mathbf{F} = x^2\mathbf{i}xe^y\mathbf{j} + 2xyz\mathrm{k}$

12.

(a) Consider again the vector field in Exercise 8 and its curl. Sketch the vector field and use your picture to explain geometrically why the curl is as you calculated.

(b) Use geometry to determine $\nabla \times \mathbf{F}$, where $\mathbf{F} = \frac{(x\mathbf{i}+y\mathbf{j}+z\mathbf{k})}{\sqrt{x^2+y^2+z^2}}$.

(c) For $\mathbf{F}$ as in part (b), verify your intuition by explicitly computing $\nabla \times \mathbf{F}$

In Exercises 21-25, establish the given identities. (You may assume that any functions and vector fields are appropriately differentiable.)

23.$\nabla \cdot (f\mathbf{F}) = f\nabla \cdot \mathbf{F} + \mathbf{F} \cdot \nabla f$