[**You may use one side of an 8.5 $\times$ 11 inch sheet of paper.**] Show all of your work clearly in the space provided or on the additional page at the end of the exam. If the additional page is used, clearly identify to which exam question it is related. Be sure to **read each problem carefully**. You should answer all 6 questions. Note that the exam is double sided.

1. (10 points) In lab 3 you were instructed to derive from Dr. Welch's shell class instead of modifying it. Give three substantive and unique reasons for why it makes sense to do this.

2. (15 points) In order to draw points, it is necessary to get the coordinates from the QMouseEvent. However, a QEvent* is passed into the function. Describe the steps you used to get the coordinate values from the QEvent*.

3. Short answer.
(a) (5 points) What command(s) must be entered in order to compile your lab 2 project.

(b) (5 points) What command(s) must be entered in order to run your lab 2 project (assuming it has been compiled).

(c) (10 points) What changes did you make to the lmakefile in order to compile your lab 3 project.

4. (20 points) Write an algorithm that can draw a line that is described by a vector (a starting point, direction, and magnitude). Discuss the advantages/disadvantages of this algorithm over Bresenham's line drawing algorithm. Is it more convenient to store a line in this manner?

5. (15 points) Describe how the intersection data structure used in polygon filling works. Indicate the key concepts that make it efficient.

6. (20 points) Define a transformation matrix that will mirror the image about the following line: $y = 3x + 2$. Be sure to show all of your work.

Additional work area for any problem. Clearly identify to which problem the work on this page is related.