Student Name:

- The quiz is closed book, closed notes, and calculator free. No form of collaboration or help is allowed.

- The quiz is **45 minutes** long. This time includes downloading, working on, and submitting a quiz **in a PDF format via Gradescope**.

- The quiz will be available starting from **5:00 PM until midnight** on scheduled week day (Thursday).

- The quiz have **20 points** in total.

- There is **no extension or quiz retake**.

- Show your full work to receive a full credit on each problem.

1. **[5 points]**

   (a) Reduce the equation $x^2 - y^2 + z^2 - 4x - 2z = 0$ to the standard form.

   (b) Classify the surface from the part (a).

   (c) Sketch the surface from part (a).

2. **[5 points]** Find the limit of the given vector function

$$\lim_{t \to 1} \left(\frac{t^2 - t}{t - 1} \mathbf{i} + \sqrt{t + 8}\, \mathbf{j} + \frac{\sin(\pi t)}{\ln t} \mathbf{k} \right)$$

3. **[5 points]** For the given vector function $r(t) = e^{2t}\,\mathbf{i} + e^{t}\,\mathbf{j}$ and $t = 0$ find:

   (a) Tangent vector $r'(t)$.

   (b) Sketch the position vector $r(t)$ and the tangent vector $r'(t)$ for the given value of t.

4. **[5 points]** Evaluate the following integral

$$\int \left(te^{2t}\,\mathbf{i} + \frac{t}{1-t}\,\mathbf{j} + \frac{1}{\sqrt{1-t^2}}\,\mathbf{k} \right) dt$$