

**Problem 1 (10 points)**

(a)  $3^{1/p}$

(b) Any solution such that  $\frac{1}{\sigma_1^2} > \frac{1}{\sigma_2^2} + \frac{1}{\sigma_3^2}$

**Problem 2 (10 points)**

(a) The sketch should show an ellipse with axes parallel to the main axes, passing through the points  $(\frac{5}{2}, 0)$ ,  $(-\frac{1}{2}, 0)$ ,  $(1, 1)$ , and  $(1, -1)$ .

(b)  $(\Phi(0) - \Phi(-\frac{2}{3}))(\Phi(\frac{1}{2}) - \Phi(-\frac{1}{2}))$

**Problem 3 (10 points)**

(a) The sketch should show the line  $x_1 + x_2 = 3\sqrt{2}$ .

(b) 8

**Problem 4 (10 points)**

(a) The sketch should show the square  $\max(|x_1|, |x_2|) = 1.5$ .

(b)  $\eta = \frac{1}{2}e^{9/16}$