Math 0230 **Midterm Exam 1** **Lecture time: 1 pm**

Fall 2013 **Your name:** _____

No calculators, no books. Show all your work (no work = no credit). Write neatly. Simplify your answers.

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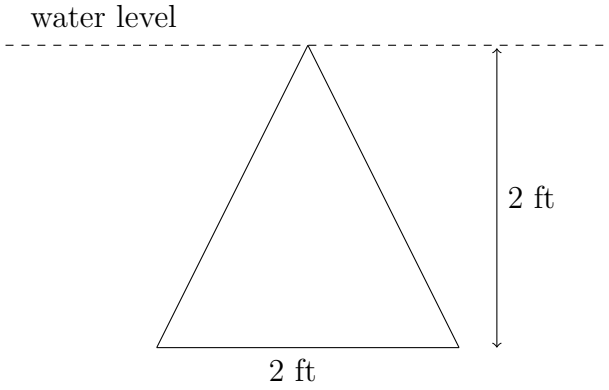
1. [15 pts] Determine whether the integral $I = \int_{-6}^{2} \frac{dx}{\sqrt[3]{2-x}}$ is convergent or divergent. Then evaluate the integral if it is convergent.

2. [15 pts] Evaluate the integral $I = \int_3^5 \frac{5x}{x^2 + x - 6}\, dx$. Simplify your answer.

3. [15 pts] Use the method of washers to find the volume of the solid obtained by rotating the region bounded by the curves $y = x^2 + 1$ and $y = x + 1$ about the y-axis.

4. [15 pts] Find the exact length of the curve $y = x^{3/2} - 2$ when $0 \leq x \leq 5$. Represent your answer as a single fraction.

5. [15 pts] A vertical plate is submerged in water and has the shape of a triangle with base of 2 feet and hight of 2 feet (see the picture below). Find the hydrostatic force in pounds against one side. The weight density of water is $62.5 = 125/2$ lb/ft^3. Represent the answer as a simple fraction.



6. [10 pts] Given: $\bar{\mathsf{a}} = \langle 3, \sqrt{3}, 2\rangle$, $\bar{\mathsf{b}} = \langle 5, -\sqrt{3}, z\rangle$, $\text{comp}_{\bar{\mathsf{a}}}\,\bar{\mathsf{b}} = 5$. Find z.

7. [15 pts] Find an equation of the plane that contains the line $x = 3 + 2t$, $y = t$, $z = 8 - t$ and is parallel to the plane $2x + 4y + 8z = 17$.

bonus problem [15 pts extra] A region in the shape of a triangle is bounded by the lines $y = 2x - 1$, $y = x$, and $y = -x + 5$. Find the volume of the solid obtained by rotating the region about the line $y = x$. Use any method.