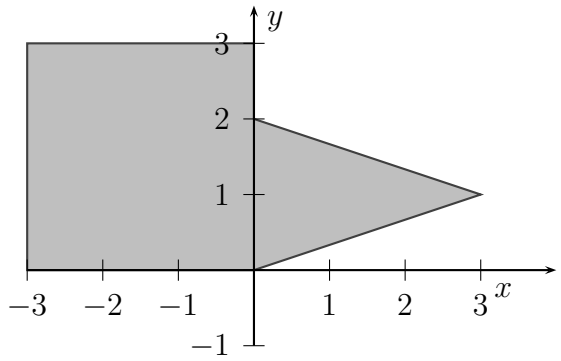
Math 113-012, Exam 3 Name _____
28-30 October 2010 Row _____
D. G. Wright Show work. Each problem or part of problem is worth 5 points.

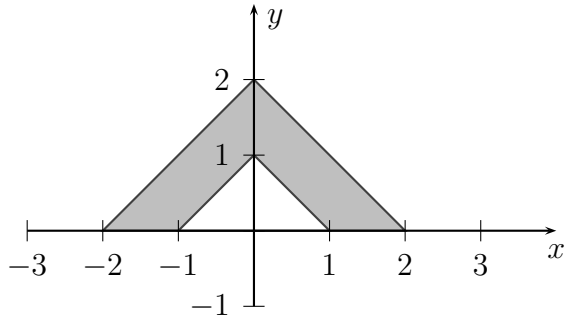
1. Find the surface area when the line segment from $(4, 0)$ to $(16, 5)$ is rotated about the y- axis.

2. The curve $y = \sqrt{4 - x^2}$, $-1 \leq x \leq 1$, is rotated about the x-axis. Find the area of the resulting surface.

3. Find the centroid of the following system consisting of a square and an isosceles triangle.



4. Find the centroid of the region between the two triangles in the x-y plane. You may use either Hint 1 or Hint 2. Hint 1: The area can be found as the difference of two areas. In a similar manner, the moment about the x-axis can be found as the difference of two moments. Hint 2: Use the Theorem of Pappus.



5. Evaluate the following limits if they exist. If the limit does not exist, so state.

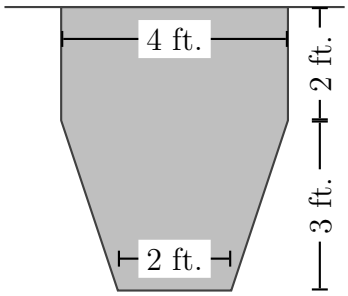
   (a) $\lim_{n\to\infty} \frac{1}{n} =$ _____

   (b) $\lim_{n\to\infty} \left(1+\frac{5}{n}\right)^n =$ _____

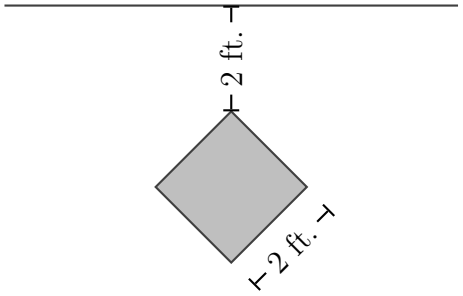
   (c) $\lim_{n\to\infty} \frac{\sqrt{n^5+2n^3+5}}{n^3} =$ _____

6. Define $\sum_{n=1}^{\infty} a_n = L$.

7. What is the hydrostatic force on the given plate whose top is at the surface of the water if the density of water is δ lbs/ft^3?



8. What is the hydrostatic force on a 2 foot by 2 foot square diamond aquarium window whose top is 2 feet below the surface of the water if the density of water is δ lbs/ft^3?



9. If $0 < r < 1$, prove that $\lim_{n\to\infty} r^n = 0$.

10. Find the fifteenth partial sum S_{15} for the series $\sum_{n=1}^{\infty}(-1)^{n+1}$.

11. Determine whether each series converges or diverges. If it converges, give its sum.

(a) $\sum_{n=1}^{\infty} \frac{n}{\sqrt{n^2+1}} =$ _____

(b) $\sum_{n=1}^{\infty} \frac{2}{4n^2-1} =$ _____

(c) $\sum_{n=1}^{\infty} \frac{2^{n+1}}{3^n} =$ _____

12. Determine whether each series converges or diverges. State any convergence/divergence tests you use. For the Integral Test, evaluate the appropriate integral. For the Comparison Test or Limit Comparison Test give the appropriate comparison series.

(a) $\displaystyle\sum_{n=1}^{\infty} ne^{-n^2}$

(b) $\displaystyle\sum_{n=1}^{\infty} \frac{\ln n}{n^3}$

(c) $\displaystyle\sum_{n=1}^{\infty} \frac{n^2+3n+1}{n^3+2n^2+n+1}$

(d) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^3+2n^2+n+1}}$

(e) $\displaystyle\sum_{n=1}^{\infty} \frac{\sin(\frac{1}{n})}{\sqrt{n}}$