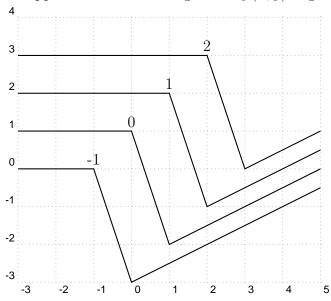
## Calculus 3 - Summer 2012 Homework #1 Due 6/11/2012

## Written Problems

- 1. Using optimization from Calculus 1, find the point on the x-axis that is closest to the point (a, b, c). Find the distance between the two points.
- 2. Find an equation of the plane that contains the line y = -2x + 3 in the plane z = 5, and goes through the point (2, -7, 23).
- 3. Suppose the contour diagram of f(x,y) is given by



Sketch the contour diagrams of

- (a) f(x-1,y)
- (b) 2f(x,y)
- (c) f(x, -y) + 3
- (d) f(y,x)

## **Presentation Problems**

- 1. Give a formula for a function whose graph is a cone with circular cross section, vertex at (2,-1,5), and opening in the negative x direction. (The axis of symmetry is parallel to the x-axis.)
- 2. Find a function y = g(x) so that

$$f(x,y) = \begin{cases} \frac{5x^6 - 5x^4y + x^2y^2 - y^3}{x^2 - y} & \text{if } y \neq x^2\\ g(x) & \text{if } y = x^2 \end{cases}$$

is continuous everywhere.

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3. At time t, the displacement of a point on a vibrating guitar string stretched between x=0 and  $x=\pi$  is given by the function

$$f(x,t) = \cos(t)\sin(x), \qquad 0 \le x \le \pi, \ 0 \le t \le 2\pi$$

- (a) Sketch the cross sections of this function with t fixed at t=0 and  $t=\frac{\pi}{4}$ . Sketch the cross sections of this function with x fixed at  $x=\frac{\pi}{4}$  and  $x=\frac{\pi}{2}$ .
- (b) What is the value of f if x = 0 or  $x = \pi$ ? Explain why this is to be expected.