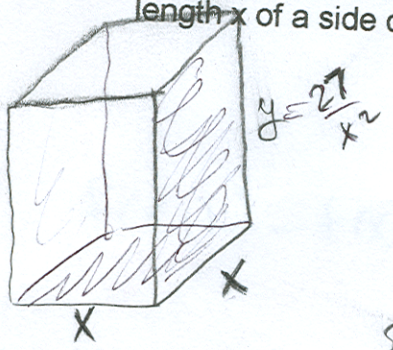
MA180 Spring 2007 Extra Credit Quiz 1A to be Added to Quiz 1

Name: Solution

1) An open box with a square base is required to have a volume of 27 cubic feet. Express the amount A of material used to make such a box as a function of the length x of a side of the base.



Volume = L · W · H

$27 = x \cdot x \cdot y \implies y = \frac{27}{x^2}$

Surface Area = Bottom + 4 sides

$= x^2 + 4\left(x \cdot \frac{27}{x^2}\right)$

$A = x^2 + \frac{108}{x}$ $\quad 0 < x$

2) Find the average rate of change for the function $f(x) = \frac{3}{x-2}$ between X = 4 to X= 7.

X	$f(x) = \frac{3}{x-2}$
4	$\frac{3}{2}$
7	$\frac{3}{5}$

Avg Rate of Change between 4 to 7 $= \frac{\frac{3}{5} - \frac{3}{2}}{7-4} = \frac{\frac{6-15}{10}}{\frac{3}{1}} = \frac{-9}{10} \cdot \frac{1}{3}$

$= \frac{-3}{10}$

3) Given $f(x)=3x^2-5x+2$ Evaluate $\frac{f(x+h)-f(x)}{h}$, where $h\neq 0$

$f(x+h)=3(x+h)^2-5(x+h)+2 \quad =3(x^2+2xh+h^2)-5x-5h+2$

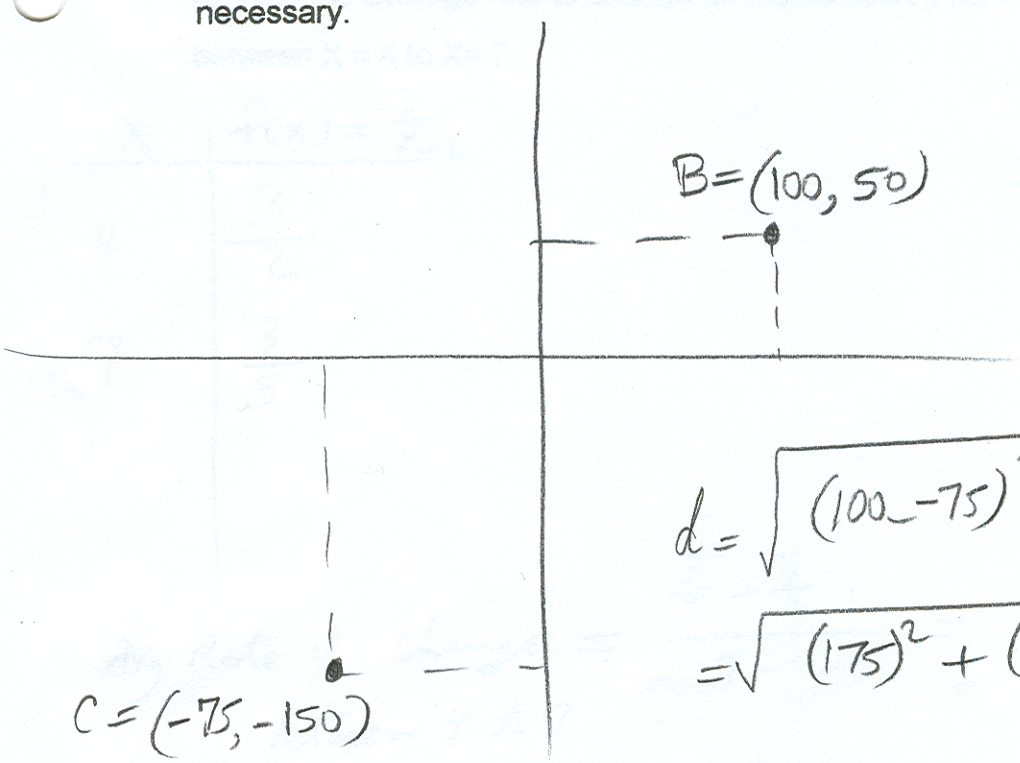
$=3x^2+6xh+3h^2-5x-5h+2$

$f(x+h)-f(x)=3x^2+6xh+3h^2-5x-5h+2-(3x^2-5x+2)$

$=3x^2+6xh+3h^2-5x-5h+2-3x^2+5x-2$

$\frac{f(x+h)-f(x)}{h}=\frac{6xh+3h^2-5h}{h}=\frac{h(6x+3h-5)}{h}=6x+3h-5$

4) City B is located at 100 miles east and 50 miles north of city A. City C is located at 75 miles west and 150 miles south of city A. Find the distance between city B and city C. You can choose city A as the origin of the rectangular coordinate system. Write your answer rounded to two decimal places, if necessary.



$d=\sqrt{(100-75)^2+(50-150)^2}$

$=\sqrt{(175)^2+(200)^2}=265.75$ miles

MA180 Spring 2007 Extra Credit Quiz 1B to be Added to Quiz 1

Name: Solution

1) Find the center (h, k) and radius r of the following circle and graph the circle

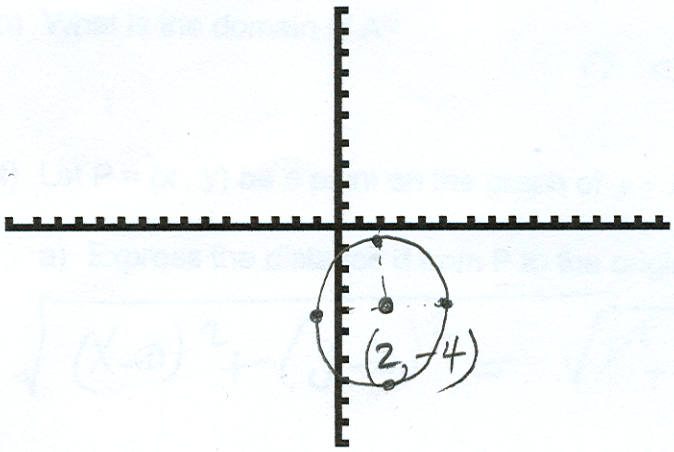
$x^2 + y^2 - 4x + 8y + 11 = 0$

$x^2 - 4x + 4 + y^2 + 8y + 16 = -11 + 4 + 16$

$(x-2)^2 + (y+4)^2 = 9$

Center $= (2, -4)$

Radius $= 3$



2) Solve $\sqrt{2x+3} - \sqrt{x+1} = 1$

$\left(\sqrt{2x+3}\right)^2 = \left(1 + \sqrt{x+1}\right)^2$

$2x+3 = (1+\sqrt{x+1})(1+\sqrt{x+1})$

$2x+3 = 1 + 2\sqrt{x+1} + x + 1$

$2x+3 = 2 + 2\sqrt{x+1} + x$

$-x \quad -2 \quad -2 \quad -x$

$x+1 = 2\sqrt{x+1}$ Square Both sides

$(x+1)^2 = 4(x+1)$

$x^2 + 2x + 1 = 4(x+1)$

$x^2 + 2x + 1 = 4x + 4$

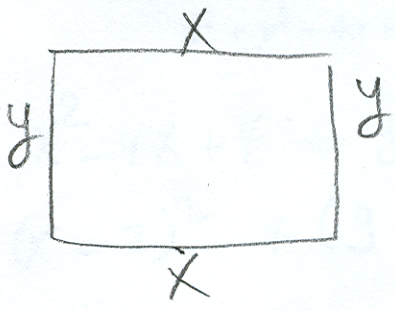
$x^2 - 2x - 3 = 0$

$(x-3)(x+1) = 0$

$x = 3$ $x = -1$

3) David has available 400 yards of fencing and wishes to enclose a rectangular area.

a) Express the area A of the rectangle as a function of the width x of the rectangle.



$2x+2y=400 \Rightarrow x+y=200$

$y=200-x$

$A=x\cdot y$

$=x(200-x)=200x-x^2$

b) What is the domain of A?

$0<x<200$

4) Let P = (x , y) be a point on the graph of $y=x^2-8$

a) Express the distance d from P to the origin as a function of x.

$d=\sqrt{(x-0)^2+(y-0)^2}=\sqrt{x^2+(x^2-8)^2}$

b) What is d if x = 0? $d=\sqrt{(-8)^2}=8$

c) What is d if x = 1? $d=\sqrt{1+(1-8)^2}=\sqrt{50}$

d) Use your calculator to graph d(x)

e) For what values of x is d smallest? $x=\pm 2.77$