MATH 1339-Practice Midterm # 2-2013

Question 1. Find two real numbers such that the sum of their squares is equal to 100 and their product is maximum.

Question 2. Let $\vec{u}$ be the vector which makes the angle of 200 degree with the horizontal line. Represent this vector in true and quadrant bearings?

Question 3. Given the vectors $\vec{u} = [4, -3]$, $\vec{v} = [1, 1]$. Find the unity vector of $\vec{u} - 2\vec{v}$.

Question 4. (12 points)

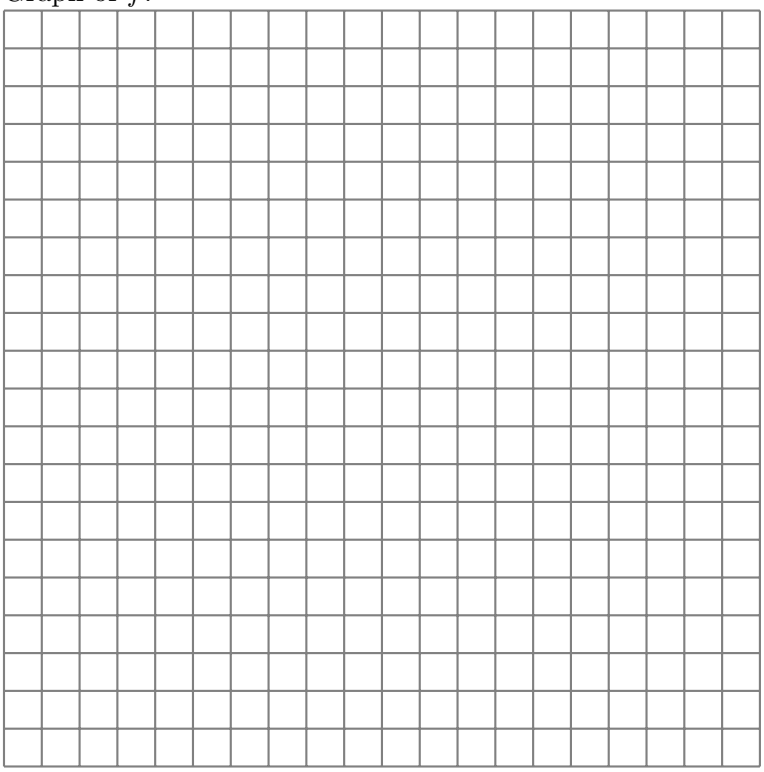
a) Let $f(x) = \sqrt{x^2 + x}$. What is the absolute maximum and minimum values of f on the interval $[3, 5]$.

b) Use the second derivative test to show that the function $f(x) = x\sqrt{x + 1}$ has a local extreme value at $x = -2/3$.

Question 5. For the following function find the appropriate information, if it exists, (listed next page) to sketch the graph and sketch the graph.

$$f(x) = \frac{x^2 + 1}{x^2 - 9}$$

Graph of f.



a) Find the domain of the function

b) Find the y-intercept and plot it

c) Find the x-intercepts and plot them

d) Find the horizontal asymptotes and plot them

e) Find the vertical asymptotes and plot them

f) Find the critical numbers

g) Find the intervals of increase and decrease

h) Identify the relative extrema and plot them

i) Find the intervals of concave up and concave down

j) Identify the points of inflection and plot them.

Question 6. (10 points) Differentiate each function.

a)

$$f(x) = \frac{\cos(x^3+1)}{\tan^2(x-1)}$$

b)

$$g(x) = \sqrt{e^x+1} + 10^{x^4-x}$$

c)

$$h(x) = \sec(x^3)e^{sin^2x}$$