Mathematics 13 Fall 2005
Instructor : Nikolaos Apostolakis
Second Exam
November 23 2005   Name: _____

Please do not turn this cover sheet until instructed to do so.

When the exam begins, please write your name on on the front page.

Please read the questions carefully and write your answers in the spaces provided on the question sheets. Justify your answers. **No credit will be given for unjustified answers.** Simplify your answers as far as you can. If you run out of room for an answer, continue on the back of the page.

Check your working carefully before submitting your paper.

There is a total of 1800 points. However, the perfect score for this exam is 1500 points. There are 300 points of **Extra Credit**.

Please turn off mobile phones, pagers and other electronic devices.

You are required to turn in *all* of the question sheets with your name written in the top right-hand corner of the first page.

1. (150 points) Find the domain of the function $f(x) = \ln\left(\ln(3x)\right)$.

2. (150 points) Sketch a graph of the function $y = 2^x$.
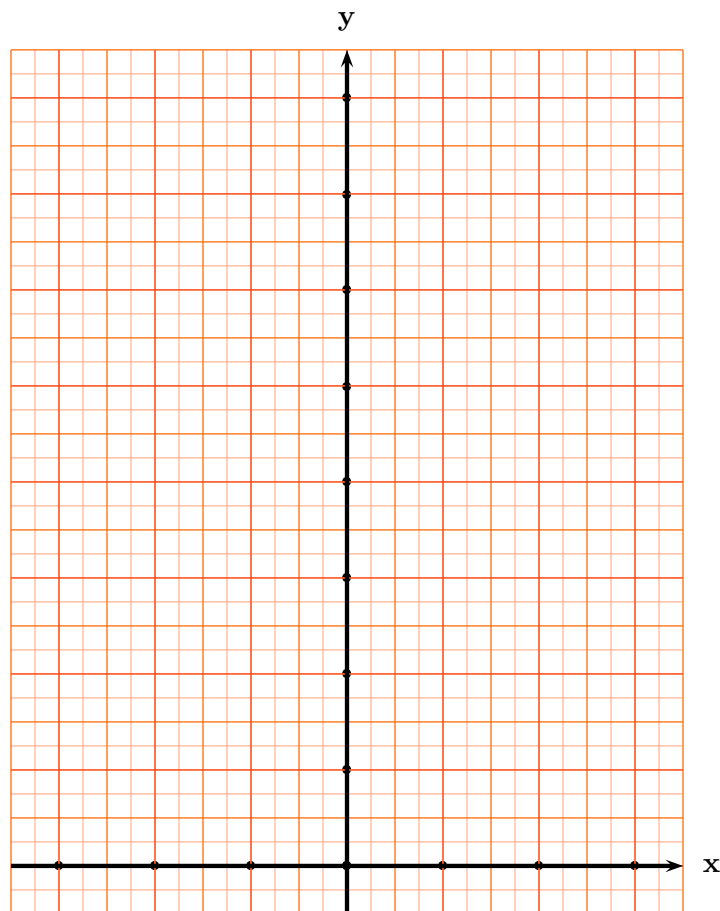
3. (150 points) Express as a sum difference or multiple of logarithms: $\log_2 \left(\dfrac{(2x-4)^6 \sqrt[5]{x^2-4y}}{x^3 y^2} \right)$
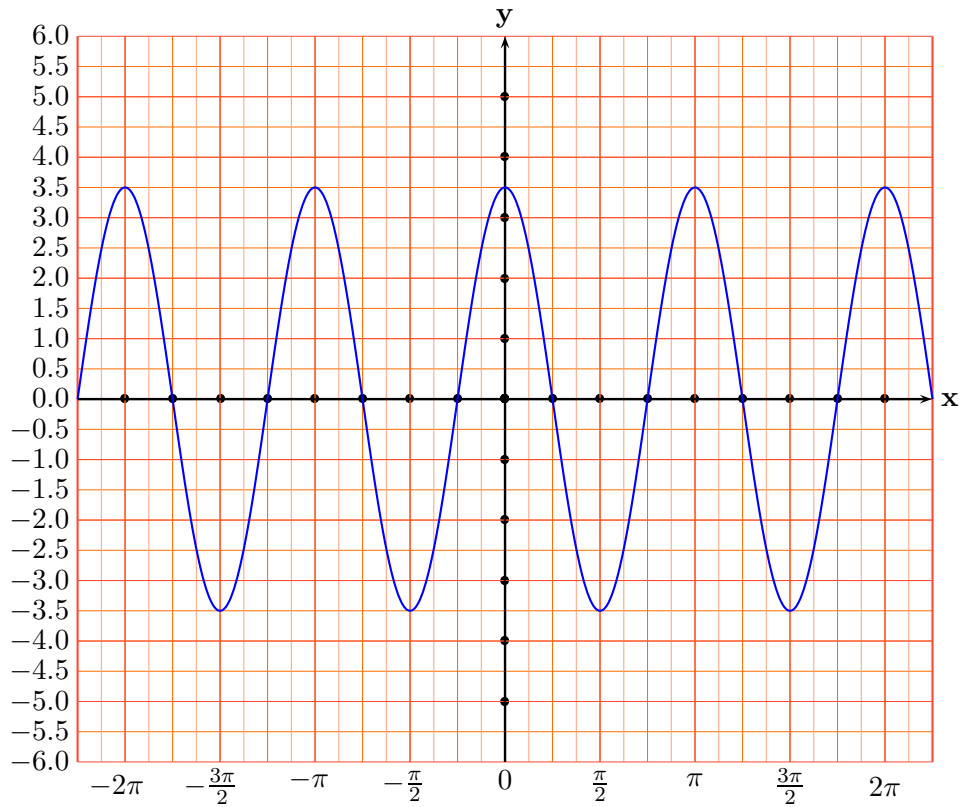
4. (150 points) Solve for y: $\log(y^5 - 2) - \log(x^2 - 5) + 3\log(7x + 6) = 1$.

5. (200 points) Solve: $e^{x^5 - \log_5 \tan x + 3\sin^2 x} = \log_2 \left(\dfrac{1}{2} \right)$.
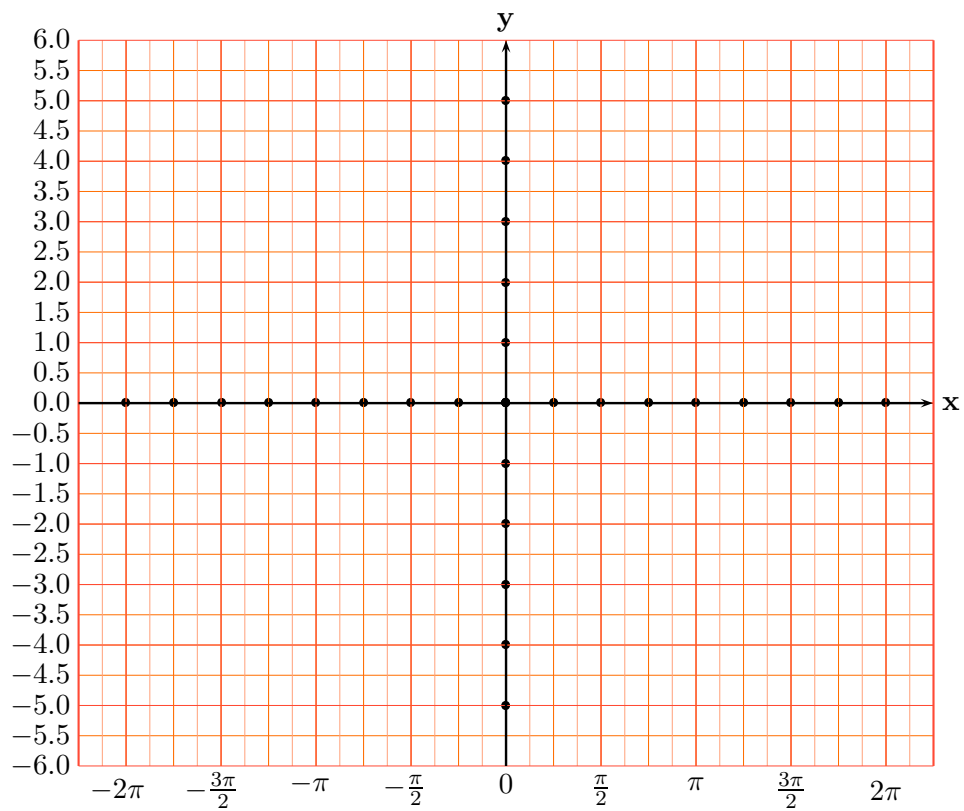
6. (150 points) Solve: $\quad 4^x = 5^{x-2}$.

7. (200 points) Solve: $\quad 2^x - 12 \cdot (2^{-x}) = 1$

8. (150 points) Find an equation of the following *sinusoidal* curve:

9. (150 points) A particle moves on a circle of radius 10 starting at at time $t = 0$ at the initial angle of $\pi/3$ rad and with constant angular velocity $\omega = 3.00$ rad/s. Write an equation that describes the displacement of the projection of the particle on the y-axis.

10. (150 points) Sketch a graph of $y = \tan x$.

11. (200 points) Prove: $\cos(x + y)\cos(x - y) = \cos^2 x - \sin^2 y$.