# Quiz 13

This quiz is optional. It is due at the **beginning of class on Moday, March 23**. No late assignments will be accepted. (Yes, this means that you need to come on time if you want credit for this quiz). Since this is a take-home quiz, the standards are higher. Write neatly, staple your work, and use graph paper for all graphs.

**For full credit, show all steps, using correct notation. Unless otherwise indicated, present the exact value of all final answers.**

1. (2 points each) Solve each of the following.

   a) $\sqrt{5x-9}-\sqrt{x-1}=2$

   b) $4x+x^2\geq 20$

   c) $\cos x+1=2\sin^2 x$

   d) $1-\sin x=2\cos^2 x$

   e) $\log_2(3-x)+\log_2(-x-1)=5$

   f) $e^{3x-7}=15$

2. (2 points) A farmer currently has 80 apple trees. Usually, each tree yields for 240 apples. If the farmer plants more trees, there will be less apples on each tree. For each additional tree planted, 2 less apples will grow on each tree. Should the farmer plant additional trees? How many? How many apples will he harvest then?

3. (2 points) Find both coordinates of all intersection points of the circles $(x-1)^2+(y-3)^2=25$ and $(x-4)^2+(y+3)^2=10$.

4. (2 points) Suppose we draw the two tangent lines from $P(-5,-2)$ to the circle $(x-1)^2+(y-4)^2=20$.

5. (2 points each) Compute the exact value of the following expressions. Make sure to simplify and rationalize all denominators.

   a) $\dfrac{\sin\left(\dfrac{11\pi}{3}\right)-\sec\left(\dfrac{11\pi}{4}\right)\cos\left(\dfrac{3\pi}{4}\right)}{\tan\left(\dfrac{13\pi}{6}\right)+\tan\left(\dfrac{11\pi}{3}\right)}$

   b) $\tan 15^\circ$

6. (2 points each) Given that $\alpha$ is an angle with $\cos\alpha=\dfrac{5}{13}$ and $180^\circ<\alpha<360^\circ$, compute the exact value of each of the following.

   a) $\sin 2\alpha$

   b) $\cos 2\alpha$

   c) $\tan 2\alpha$

   d) $\sin(\alpha-45^\circ)$

   e) $\cos(90^\circ-\alpha)$

   f) $\tan(\alpha+45^\circ)$

7. (1 point each) Simplify each of the following.

   a) $2^{\log_4 A}$ b) $\log_3\left(9^B\right)$ c) $e^{-\ln A}+e^{-\ln B}$ d) $e^{-\ln A-\ln B}$

8. (2 points each) Simplify or write it as a single logarithm.

   a) $\log_2\left(5x^2\right)+\log_2\left(40x^4\right)-2\log_2\left(5x^3\right)$

   b) $\log_3 4\cdot\log_4 5\cdot\log_5 6\cdot\log_6 7\cdot\log_7 8\cdot\log_8 9$

   c) $\log_2 5-\log_4 10+1$

9. (2 points each) Suppose that $A=\log_3 2$. Write each of the following in terms of $A$.

   a) $\log_3 6$ b) $\log_3 48$ c) $\log_6 48$ d) $\log_3\left(\dfrac{3}{4}\right)$ e) $\log_2 3$

10. (2 points) A water storage tank has the shape of a cylinder with diameter 20 feet. It is placed so that the circular cross sections are vertical. If the depth of the water is 12 feet, what percentage of the total capacity is used?