Math 1550 Final Exam – Fall 2016

Show all of your work in your blue book, or you will lose credit. Work the problems in order. Be neat, use proper notation, and circle your answers. You may leave answers as radicals or trig functions if they cannot be simplified. Write out the formulas you use. You may *not* use a calculator, cell phone, or other electronic device. All 18 problems have equal value.

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1. Find the center and radius for the circle given by $3x^2 + 12x + 3y^2 - 24y - 87 = 0$.

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2. A tree is 21 inches high after 2 years, and 48 inches high after 5 years.
    a) Assume that growth will be linear, and write an equation for the height in inches h after t years.
    b) Use this equation to predict the height after 8 years.

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3. Find the inverse function of $f(x) = \dfrac{x}{2} + 4$. Then graph the function and the inverse on the same set of axes. Label clearly the graphs and their intercepts with the axes.

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4. Solve for x, and write the answer in interval notation: $(x-3)(x+5) \geq 0$

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5. A ball is thrown straight up from the ground, and its height as a function of time is given by $h = -16t^2 + 64t + 8$, where h is in feet and t is in seconds. Find the maximum height the ball reaches, and how long it takes to reach the maximum height.

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6. Sketch the graph of $f(x) = \dfrac{x-4}{x-2}$. Also, state the following clearly:

    a) Domain of f
    b) Intercept(s) with x-axis
    c) Intercept(s) with y-axis
    d) Vertical asymptote(s)
    e) Horizontal asymptote(s)
Be sure to label all intercepts and asymptotes on the graph.

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7. Sketch the graph of $f(x) = (x^2 - 4)(x-5)^2$. Also, state the following clearly:
    a) Zeros (roots) and their multiplicity
    b) Intercept(s) with y-axis
Be sure to show the end behavior on the graph, and label all intercepts.

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8. Solve for x: $\log_3(x+4) + \log_3(x-4) = 2$

9. Solve for x: $\qquad$ $10^{(2x-3)} = 100$

10. Give the *exact* values for the following expressions:
   a) $\sin(150°)$
   b) $\cos(-\pi/4)$
   c) $\tan(120°)$
   d) $\cos^{-1}\left(\sqrt{2}/2\right)$
   e) $\sin\left[\cos^{-1}(3/5)\right]$

11. An angle θ is in the third quadrant and its tangent is (3/4). Find the *exact* values of the other 5 trig functions.

12. Frank and Joe are standing together 200 feet (horizontally) from the base of a water tower. They estimate that the angle of elevation of the top of the tower is 25°. How high is the tower? (Neglect how tall the boys are.)

13. Two boats leave port at the same time. One travels 5 miles per hour and the other 6 miles per hour. Their headings differ by 60°. How far apart will they be after two hours?

14. Graph at least one period of $y = 2\sin(3x)$.
State clearly the amplitude, period, phase shift, and intercepts.

15. Find all solutions on the interval $[0, 2\pi)$: $\qquad$ $\cos^2 x + 3\cos x + 2 = 0$

16. Given the vectors $A = \langle 5,6 \rangle$ and $B = \langle 3,4 \rangle$, find:
   a) $3A - 2B$
   b) $|B|$

17. Solve the system: $\qquad \begin{cases} 5x - 3y = 17 \\ 2x + 4y = 12 \end{cases}$

18. Find the partial fraction decomposition: $\qquad \dfrac{5x-13}{(x-3)^2}$

(End)