

**Math 1550 Final Exam – Fall 2013**

*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. Write out the formulas you use. You may use a basic scientific calculator, but *not* a graphing calculator or an advanced scientific one (such as a TI 36X Pro) that solves equations. You may *not* use a cell phone or other electronic device as a calculator. All 18 problems have equal value.*

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1. Find the center and radius for the circle given by  $3x^2 + 12x + 3y^2 - 24y - 15 = 0$ .

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2. Solve for  $x$ , and write the answer in interval notation:  $\frac{x-5}{x-9} \geq 0$

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3. Find the inverse function of  $f(x) = \frac{x-5}{3}$ . 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. Texas Tech has about 33,000 students now, and is planning for 40,000 in 2020. Assume that enrollment growth will be linear, and write an equation for the expected number of students  $N$  after  $t$  years, with  $t = 0$  in 2013.

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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  $h = -16t^2 + 104t$ , 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  $f(x) = \frac{9-x}{3-x}$ . Also, state the following clearly:

- a) Domain of  $f$
  - b) Range of  $f$
  - c) Intercept(s) with  $x$ -axis
  - d) Intercept(s) with  $y$ -axis
  - e) Vertical asymptote(s)
  - f) Horizontal asymptote(s)
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7. Solve for  $x$ :  $\log_2(x+2) + \log_2(x-2) = 3$

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8. The population of Lubbock can be estimated by  $P = P_0 e^{0.015t}$  where  $P$  is the population  $t$  years from now and  $P_0$  is the current population. The current population is 236,000. In what calendar year will the population reach 300,000?

(Over)

9. Give the *exact* values for the following expressions (*not* calculator approximations):

a)  $\sin(120^\circ)$

b)  $\cos(-\pi/4)$

c)  $\tan(150^\circ)$

d)  $\cos^{-1}(\sqrt{3}/2)$

e)  $\sin[\cos^{-1}(4/5)]$

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10. An angle  $\theta$  is in the third quadrant and its tangent is  $(7/24)$ . Find the *exact* values of the other 5 trig functions (*not* calculator approximations).

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11. Graph at least one period of  $y = 3 \cos(2x)$ .

State clearly the amplitude, period, phase shift, and intercepts.

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12. Find all solutions on the interval  $[0, 2\pi)$ :  $\sin^2 x - \sin x - 2 = 0$

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13. Anne is standing 250 feet from the base of a tree. She estimates that the angle of elevation of the top of the tree is  $22^\circ$ . How high is the tree?

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14. Two of the angles of a triangle are  $47^\circ$  and  $55^\circ$ . The side opposite the  $55^\circ$  angle is 30 inches long. How long is the side opposite the  $47^\circ$  angle?

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15. Two boats leave port at the same time. One travels 12 miles per hour and the other 15 miles per hour. Their headings differ by  $50^\circ$ . How far apart will they be after two hours?

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16. Given the vectors  $A = \langle 4, 8 \rangle$  and  $B = \langle 3, 5 \rangle$ , find:

a)  $3A - 2B$

b)  $|B|$

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17. Solve the system: 
$$\begin{cases} 3x + 5y = 3 \\ 4x - 2y = 30 \end{cases}$$

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18. Find the partial fraction decomposition: 
$$\frac{8x - 10}{(x - 2)^2}$$

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(End)