

Math 1550 Final Exam – Fall 2012

Show all of your work in your blue book, or you will lose credit. All of the problems have equal value. Work the problems in order, and use one page per problem. Be neat, and use proper notation. Write out the formulas you use. You may use a basic scientific calculator, but not a graphing one.

1. Find the center and radius for the circle given by $5x^2 - 20x + 5y^2 + 40y + 10 = 0$.
2. A ball is thrown straight up from the ground, and its height as a function of time is given by $h = -16t^2 + 88t$, where h is in feet and t is in seconds. Find the maximum height the ball reaches, and how long it takes to hit the ground.
3. Solve for x :
$$\frac{3-x}{9-x} \geq 0$$
4. Find the inverse function of $f(x) = 2x + 5$. Check your answer by calculating $f(f^{-1}(x))$. Then graph the function and the inverse on the same set of axes. Label clearly the graphs and their intercepts with the axes.
5. A machine tool costs \$25,000 when it is new, and it is worth \$11,000 after 5 years.
 - a) Assume that the depreciation is linear, and find an equation that relates the value in dollars V to the age in years t .
 - b) Use the equation to predict the value after 7 years.
6. Sketch the graph of $f(x) = \frac{5x+10}{x-2}$. 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)
7. Solve for x :
$$\log_2(x+3) - \log_2(x-3) = 4$$
8. The population of the Earth can be estimated by $P = P_0 e^{0.011t}$ where P is population t years from now and P_0 is the current population. The current population is 7.077 billion. In what calendar year will the population reach 10 billion?
(Note the decimal in the exponent: 0.011t)

(Over)

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

- a) $\cos(150^\circ)$
- b) $\sin(-\pi/4)$
- c) $\tan(315^\circ)$
- d) $\sin^{-1}(\sqrt{3}/2)$
- e) $\tan[\cos^{-1}(4/5)]$

10. An angle θ is in the second quadrant and its tangent is $(-5/12)$. Find the *exact* values of the other 5 trig functions (*not* calculator approximations).

11. Given $A\sin\theta + \cos\theta = 1$ and $B\sin\theta - \cos\theta = 1$, prove that $AB = 1$.
(Hint: Solve the first equation for A and the second for B , and then compute AB .)

12. Graph at least one period of $y = 5\sin(2x - \pi/2)$.
State clearly the amplitude, period, phase shift, and intercepts.

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

14. Mary is standing 200 feet from the base of a water tower. Holding a sextant at eye level, she finds that the angle of elevation of the top of the tower is 28° . Her eyes are 5 feet above the ground. How high is the tower (to the nearest foot)?

15. Two of the angles of a triangle are 48° and 64° . The side opposite the 48° angle is 20 centimeters long. How long is the side opposite the 64° angle?

16. Two of the sides of a triangle are 6 and 11 inches, and the included angle (the angle between them) is 42° . How long is the other side?

17. Solve the system:
$$\begin{cases} 4x - 5y = -23 \\ 3x + 7y = 101 \end{cases}$$

18. Find the partial fraction decomposition:
$$\frac{3x+17}{(x+4)^2}$$