

Spring 2015 MATH 1550: Precalculus Final Exam

Show all your work in your blue book, or you will lose credit. Write out the formulas you use. Work the problems in order, one problem per page. You may use a basic scientific calculator. You may not use a cell phone or other electronic device as a calculator.

The correct answer with no or incorrect work will earn you NO credit.

1. Find the center and radius for the circle given by the equation $3x^2 + 3y^2 - 18x + 6y = 45$

2. Solve the following inequality for x. Write your answer in interval notation. $\frac{x-3}{x+7} \geq 0$

3. Find the inverse function of $f(x) = \frac{x+5}{2}$. Then sketch the given function and its inverse on the same coordinate plane.

4. Solve the following equations using any method of your choice.

a) $x^2 - 3x - 7 = 0$

b) $2x^2 - 3x - 9 = 0$

5. Consider the rational function $f(x) = \frac{4x^2-1}{(x-1)(x+4)}$.

- a) Find the domain of f(x).
 - b) Find the vertical asymptotes and holes of f(x).
 - c) Find the x and y intercepts of f(x).
 - d) Find the horizontal asymptotes of f(x).
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6. Solve for x: $\log_3(x - 5) + \log_3(x + 3) = 2$

7. The population of a certain bacterial colony can be estimated by $P = P_0 e^{0.12t}$ where P is the population t hours from now and P_0 is the current population. If the current population is 17, in how many hours will the population reach 100? Round to two decimal places.

8. Give the exact values for the following expressions (NOT calculator approximations).

a) $\sin\left(\frac{3\pi}{4}\right)$

d) $\cos^{-1}\left(-\frac{1}{2}\right)$ on $[0, \pi]$

b) $\tan(-330^\circ)$

e) $\tan^{-1}\left(\frac{\sqrt{3}}{3}\right)$ on $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

c) $\csc(45^\circ)$

f) $\sin\left(\cos^{-1}\left(\frac{8}{17}\right)\right)$

9. If $\sin(\theta) = -\frac{3}{5}$ and θ lies in Quadrant III, find:

- a) The other five trigonometric functions of θ .
 - b) $\cos(2\theta)$.
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10. Two boats leave the port at the same time. One travels 20 mph and the other travels 15 mph. Their directions differ by 70 degrees. How far apart will the boats be after three hours? **Round your answer to two decimal places.**

11. Find all real solutions of $2\sin^2x + 3\sin(x) - 2 = 0$ on the interval $[0, 2\pi)$.

12. Graph at least one period of $f(x) = 2\sin(x) + 1$. Clearly state the amplitude, period, phase shift and intercepts.

13. Two of the angles of a triangle are 45° and 120° . The side opposite the 45° angle is 6 inches. Find the side opposite the 120° angle (exact answer, no decimals).

14. Given the vectors $\mathbf{v} = \langle 1, -1 \rangle$ and $\mathbf{u} = \langle -5, 12 \rangle$, find:

- a) $\mathbf{w} = 2\mathbf{u} + 3\mathbf{v}$
 - b) $p = -4\mathbf{u} - \mathbf{v}$
 - c) $\|\mathbf{u}\|$
 - d) A unit vector in the same direction as \mathbf{v} .
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15. Solve the system of equations:

a)
$$\begin{cases} 2x + y = 1 \\ 4x - 5y = 9 \end{cases}$$

b)
$$\begin{cases} x - 4y = 11 \\ 3x - y = 11 \end{cases}$$

16. Find the partial fraction decomposition of

$$\frac{2x}{(x-3)(x-2)}$$

17. Find the sum of the first ten terms of the arithmetic sequence 4, 7, 10...
