

Assessment test for those considering Math 124

Instructions for working the problems:

- You should allow yourself 90 minutes to solve the problems.
- Ideally, you should plan to work the problems in one session while focused exclusively on the test problems.
- Do not use graphing tools your calculator might provide. In Math 124, only non-graphing calculators are allowed, so create the same testing situation for yourself.
- Turn off all screens so you can focus and so that this will be a true indication of what you can do.
- Keep a record of your results so that you can easily find the problems you did solve and those you did not.
- If you do not get the correct answer on the first try, check your work and look for errors, or start again with perhaps a different method.

If you can complete all problems correctly, you have the kind of preparation necessary for Math 124.

The 10 problems are on the next page.

1. A person is walking directly away from a light on an 18-foot tall pole. At this instant, the person casts a shadow 14 feet long. If they walk 10 feet farther from the pole, they will cast a shadow 20 feet long. How tall is the person?

2. Line A passes through the points $(1, 5)$ and $(6, 3)$.

Line B is perpendicular to line A and passes through the point $(4, 4)$.

At what point do Line A and Line B intersect?

3. The graph of a quadratic function f passes through the points $(-2, 4)$, $(1, 1)$ and $(5, 0)$. What is the y -intercept of the graph of f ?

4. Let $f(x) = 2x^2 - 3x + 5$. Let $g(x) = f(6 - x)$. What is the lowest point on the graph of g ?

5. You are walking along a flat, horizontal road toward a mountain in the distance. You measure the mountain's angle of elevation and find it to be 4° . You then walk 2 kilometers closer to the mountain and measure the angle again: this time the angle is 4.5° .

How tall is the mountain?

6. The population of town A grows exponentially and doubles every 7 years. Currently, town A has a population of 4000.

The population of town B increases at the constant rate of 12% per year. Five years from now, town B will have a population that is half that of town A.

When, in years from now, will the populations of the two towns be equal?

7. Find all solutions to the equation $\sin x = -0.7$ with $-1 \leq x \leq 10$.

8. Find the equation of one of the tangent lines to the circle $x^2 + y^2 = 5^2$ that pass through the point $\left(\frac{25}{3}, 0\right)$.

9. Let $f(x) = \frac{2x + 4}{5x + 2}$. Find the equations of the horizontal and vertical asymptotes of

$$y = f(1 - 3x).$$

10. Two numbers sum to 100. How small can the sum of one number and the square of the other number be?

Answers

1. 6.75 feet tall
2. $\left(\frac{114}{29}, \frac{111}{29}\right)$
3. $y = \frac{25}{14}$
4. $\left(\frac{21}{4}, \frac{31}{8}\right)$
5. The mountain is 1254.34 meters tall.
6. 53.4458 years from now
7. There are three solutions: $x \approx -0.77539, 3.91699,$ and 5.50778 .
8. The two tangent lines are $y = -\frac{3}{4}x + \frac{25}{4}$ and $y = \frac{3}{4}x - \frac{25}{4}$.
9. The horizontal asymptote is $y = \frac{2}{5}$ and the vertical asymptote is $x = \frac{7}{15}$.
10. The sum is ≥ 99.75 with equality when one number is $\frac{1}{2}$ and the other is 99.5.