

Calculus: Preparation

Be sure you know how to solve each of the following. Do not panic if you cannot; rather, study those problems which you can't do and refresh your understanding of the concept. You will not need to have all these skills perfectly remastered on the first day, but you should be ready to discuss the problems.

Solutions will be made available at the start of school.

1. If $f(t) = 4e^{-0.75t}$, for what t does $f(t) = 0.5$? Leave your answer in terms of a logarithm.
2. At time $t = 0$ seconds, a projectile is at a position 5m away from some fixed point. The projectile is moving away from the fixed point at a speed of 20 m/s. Write a function $d(t)$ whose value is the distance between the projectile and fixed point at time t .
3. A projectile is moving at a constant speed of 15 m/s and on a path directly away from some fixed reference point. At time $t = 6$ seconds, the projectile is observed to be 125m away from the reference point. Write a function $d(t)$ whose value is the distance, at time t , between the projectile and the reference point. How far from the reference point was the projectile at time $t = 0$.
4. $\sqrt{4x + 10} - 4 = \sqrt{2x - 10}$. Solve for real values of x , if any.
5. A certain wave is modeled by the function $w(t) = 4 \sin(3t)$. What is the first positive value of t for which $w(t) = 2\sqrt{2}$?
6. A function $p(x)$ varies in a sinusoidal pattern. It has a range of real numbers between 5 and 50, inclusive, and it has a frequency of 20Hz. Write an equation for $p(x)$.
7. Determine the exact value of $\sin(\frac{\pi}{12})$, $\cos(\frac{\pi}{12})$, and $\tan(\frac{\pi}{12})$.
8. An object is formed from half-sphere with a radius of 5cm which is surmounted by a right circular cone of like radius and a length of 10cm.
 - (a) What is the total volume of this object?
 - (b) What is the length, on the surface of the object, from the tip of the cone to the edge of the hemisphere?
9. Flight 453 is 20 miles due south of New Haven. Flight 542 is 30 miles due north of New London. New London is 30 miles due east of New Haven. How far apart are the two flights? What is the compass bearing of New London from Flight 453's position? Assume 0° is due north and that you do not have to worry about magnetic declination.

10. Simplify the following:

$$\frac{66x^{\frac{5}{3}} - 2x^4 + \sqrt[4]{x^{12}}}{4(x^{0.6})^{10} - 2x}$$

11. Simplify the following:

$$\frac{\frac{4x^2 - 16}{x + 3}}{\frac{2(x + 2)}{5(x^2 + 6x + 9)}}$$

12. Remove the radical from the denominator of the following:

$$\frac{2 + \sqrt{x}}{2 - \sqrt{x}}$$

13. Decompose the following rational function into partial fractions:

$$r(x) = \frac{3x + 5}{x^2 - 2x - 35}$$