

Pre-Calculus Team Questions

February, 1996

1. If $|2x+3| \geq 5$, then $x = ?$

2. Find $A + B + C + D$.

A = The distance between the points $(3, -1)$ and $(7, 2)$.

B = y : The midpoint (x, y) of the line segment joining $(6, -9)$ and $(-3, 2)$.

C = x : The point $(x, 0)$ that is equidistant from $(6, 1)$ and $(-2, 5)$.

D = The slope of the line passing through $(-5, 9)$ and $(1, -3)$.

3. Given that $f(x) = a(x-b)^2 + c$ and that $f(1) = f(5) = -1$ and that $f(0) = -11$, find the values of a , b , and c .

4. S is the base of a vertical pole ST . S lies on AB , where A and B are 92.5 meters apart on horizontal ground. Angle $TAB = 20^\circ$ and angle $TBA = 30^\circ$. Calculate the length of the pole ST to the nearest tenth of a meter.

5. Find $x, y \in \mathbb{R}$ so that $(2x - 4y + 3)^2 + (-x + 3y - 2)^2 = 0$.

6. Determine a and b so that the equation $2x^2 + ax + b = 0$ has the roots 1 and 3.

7. Given that the $\sec \theta = 5$ and $\tan \theta = 2\sqrt{6}$, find $\sin \theta$.

8. Find $\tan \left(\arcsin \frac{x-2}{3} \right)$.

9. A group of high school students are given the job of measuring the height of the new science building. From a point on level ground, they measure an angle of elevation to the top of the building of $21^\circ 34'$. They move 50 feet closer and find the angle is now $35^\circ 41'$. How high is the science building? (Express your answer accurate to the nearest foot.)

10. Solve for x in the interval $0 \leq x < 2\pi$: $\tan(x+\pi) + 2 \sin(x+\pi) = 0$.
11. Captain Buck "Ace" Malloy is flying commercial flight 1123 out of San Francisco heading due east at 275 km/hr when he spots an electrical storm straight ahead. He turns the jet 20° to the north to avoid the storm and continues in this direction for one hour. Then he makes a second correction back toward his original flight path. Forty minutes after his second correction he intersects his original flight path at an acute angle and turns his craft through an obtuse angle to get back on course. How much time did "Ace" lose from his original flight plan in order to avoid the storm? ("Ace" maintains a speed of 275 km/hr.) (Give an answer in hours and with minutes correct to the nearest one tenth of a minute.)
12. Solve for x : $\log(3x+7) + \log(x-2) = 1$.
13. Find a point $(0, y)$ that is equidistant from $(6, 1)$ and $(-1, -2)$.
14. Find the center and radius of the circle $2x^2 + 2y^2 - 2x - 3y - 3 = 0$.
15. Find the partial fraction decomposition of $\frac{5x^2 - 9x + 12}{(x-2)(x^2 + x + 1)}$.