

1. Find the equation in standard form of the tangent line to the circle  $x^2 + y^2 - 12x + 8y + 7 = 0$  at the point (3, 2).  
 a.  $x + y = 5$       b.  $2x - y = 4$       c.  $3x - 2y = 0$       d.  $x - 2y = -1$       e. NOTA
2. Find the equation of the directrix of the parabola  $y^2 + 8x - 6y + 25 = 0$ .  
 a.  $x = 1$       b.  $y = 1$       c.  $x = 0$       d.  $y = 5$       e. NOTA
3. Each of the statements below can be completed accurately with the word “always”, “sometimes” or “never”. How many of the statements below will be completed with the word “sometimes”?  
 I. A square is \_\_\_\_\_ a rectangle.  
 II. The diagonals of a rectangle are \_\_\_\_\_ congruent.  
 III. The diagonals of a parallelogram \_\_\_\_\_ bisect the angles.  
 IV. A trapezoid \_\_\_\_\_ has three congruent sides  
 a. 0      b. 1      c. 2      d. 3      e. NOTA
4. What is the constant term in the expansion of  $\left(x^2 - \frac{3}{x^3}\right)^{10}$ ?  
 a. -81      b. 81      c. -630      d. 17,010      e. NOTA
5. Evaluate:  $\sum_{i=21}^{200} (2i - 7) =$   
 a. 38,520      b. 38,306      c. 46,700      d. 19,280      e.. NOTA
6. Simplify the expression, for  $x > 1$ :  $\frac{(x+3)!(8x-8)(0.5x+0.5)^{n+1}}{x!(x+2)(x^2-1)(1+x)^n 2^{-n}}$   
 a. 1      b. 4      c.  $\frac{1}{2}(x+3)(x+1)$       d.  $4(x+3)(x+1)$       e. NOTA
7. What is the remainder of  $(x - i)^{2009}$  when divided by  $x$ . ( $i = \sqrt{-1}$ )?  
 a. -i      b. -1      c. 1      d.  $(xi)^{2005}$       e. NOTA
8. My bank account compounds continuously. How long in years will it take my account to double if I make the first deposit at a rate of  $(100 \ln 3)\%$ ?  
 a.  $\log 2$       b.  $\log_3 2$       c.  $2^3$       d.  $3^2$       e. NOTA
9. Simplify:  $\frac{(\log 2)(\log 3)(\log 4) \cdots (\log 2007)(\log 2008)(\log 2009)}{(\ln 3)(\ln 4)(\ln 5) \cdots (\ln 2007)(\ln 2008)(\ln 2009)}$   
 a.  $\frac{\log 2}{(\ln 10)^{2009}}$       b.  $\frac{\ln 2}{(\ln 10)^{2009}}$       c.  $\frac{\ln 2}{2008(\ln 10)}$       d.  $\frac{\log 2}{(\ln 10)^{2007}}$       e. NOTA



20. Given isosceles triangle DEC with congruent sides DE and DC: If DE is extended through point E to point B, and if CE is extended through point E to point A, another isosceles triangle ABE is formed with congruent sides AB and BE. If the measure of angle A is  $5x - 7$  and the measure of angle D is  $4x + 12$ , find the value of  $x$ .

- a. 13                      b. 19                      c.  $\frac{163}{13}$                       d.  $\frac{85}{9}$                       e. NOTA

21. Solve for the positive value of  $b$  such that the following equation has a double root.

$$6x^2 - 2bx + \frac{3}{4} = 0.$$

- a.  $\frac{3}{2}$                       b.  $\frac{3\sqrt{2}}{2}$                       c. 3                      d.  $3\sqrt{2}$                       e. NOTA

22. What is the area enclosed by a rhombus with sides of length 29 and main diagonal of length 42?

- a. 609                      b. 840                      c. 882                      d. 1160                      e. NOTA

23. What is the area enclosed by the ellipse  $16x^2 - 64x + 9y^2 + 54y = -73$ ?

- a.  $3\sqrt{2}\pi$                       b.  $6\pi$                       c.  $6\sqrt{3}\pi$                       d.  $12\pi$                       e. NOTA

24. What is the sum of real roots in the equation  $2x^3 - 2x^2 + 18x - 18 = 0$ ?

- a. -1                      b. 0                      c. 1                      d. 4                      e. NOTA

25. What is the value of  $\sum_{k=9}^{17} k^3$ ?

- a. 16,471                      b. 17,200                      c. 21,384                      d. 22,113                      e. NOTA

26. Which lines or segments of a triangle are concurrent in a point equally distant from the vertices of the triangle?

- a. Angle Bisectors                      b. Altitudes                      c. Medians  
d. Perpendicular bisectors of the sides                      e. NOTA

27. Given parallelogram ZIWE with the measure of angle I =  $4x + 15$  and the measure of angle E =  $6x - 2$ , then find the measure of angle W.

- a. 51                      b. 81                      c. 121                      d. 131                      e. NOTA

28. If a diagonal of a quadrilateral divides the quadrilateral into two congruent triangles, then which of the following must be true about the quadrilateral?

- a. It is a square                      b. It is a rectangle                      c. It is a rhombus  
d. It is a parallelogram                      e. NOTA

29. The measure of an obtuse angle of a parallelogram is 30 degrees more than twice the measure of the next consecutive angle of the parallelogram. Find the degree measure of the smaller angle.

- a. 50                      b. 59                      c. 61                      d. 80                      e. NOTA

30. The altitude to the hypotenuse of an isosceles right triangle has length 8. What is the length of the hypotenuse of the original triangle?

- a. More information needed                      b. 8                      c.  $8\sqrt{2}$                       d. 16                      e. NOTA