

**2001 Hoover High School Mathematics Tournament**  
**Algebra I Examination**

1. If  $D$  = the discriminant of  $y = 2x^2 - 7x + 5$  and  $R$  = the largest root of  $y = x^2 + 4x + 3$ , find  $R^D$

- A) -1      B)  $-\frac{1}{9}$       C) 14643      D) 1      E) N.O.T.A.

2. Find an equation of the line that has  $y$ -intercept 5 and is parallel to the line  $6x - 5y = 4$ .

- A)  $6x + 5y = 25$       B)  $6x - 5y = -25$       C)  $6y - 5x = 30$   
D)  $5x - 6y = 30$       E) N.O.T.A.

3. Simplify:  $\sqrt[4]{\frac{49^2 \cdot 8^5}{2^3 \cdot 3^8}}$

- A)  $\frac{3136}{81}$       B)  $\frac{12544}{81}$       C)  $\frac{392}{9}$       D)  $\frac{56}{9}$       E) N.O.T.A.

4. Given:  $(2x + 3)(x - 5)(8x - 11)(x + 5) = Ax^4 + Bx^3 + Cx^2 + Dx + E$ . Find  $A + B - C + D - E$ .

- A) 360      B) -1294      C) -424      D) -1190      E) N.O.T.A.

5. Given  $3x + 2y = 8$  and  $7x - 11y = 4$ , find  $-x + 9y$ .

- A)  $-\frac{1652}{47}$       B)  $\frac{300}{47}$       C)  $\frac{492}{47}$       D)  $\frac{1364}{141}$       E) N.O.T.A.

6. Solve the inequality:  $|2x - 3| < 11$ .

- A)  $x < 7$       B)  $x > -4$       C)  $-4 < x < 7$       D)  $x > 7$  or  $x < -4$       E) N.O.T.A.

7. If  $y$  varies directly with  $x^2$  and inversely as the square root of  $z$  and  $y = 7$  when  $x = 5$  and  $z = 16$ , find  $y$  when  $x = 3$  and  $z = 289$ .

- A)  $\frac{700}{153}$       B)  $\frac{225}{476}$       C)  $\frac{84}{85}$       D)  $\frac{252}{425}$       E) N.O.T.A.

8. Simplify:  $\frac{(b^3 + c^3)(b^2 + 2bc + c^2)}{(b^2 - bc + c^2)(b + c)}$ .

- A)  $-2(b^2 + c^2)$     B)  $(b+c)^2$     C)  $b^2 - bc + c^2$     D)  $\frac{b^3 + c^3}{-bc}$     E) N.O.T.A.

9. Find the area of the region bounded by the graphs of  $2x + 5y = 10$ ,  $-2x + 5y = 10$ , and  $y = 0$ .

- A) 20    B) 10    C) 7.5    D) 5    E) N.O.T.A.

10. What polynomial must be subtracted from  $5x^3 + 2x + 1$  to obtain  $3x^4 + 2x^3 + 8x^2 + 2x - 1$ ?

- A)  $-3x^4 + 3x^3 - 8x^2 + 2$   
 B)  $-3x^4 - 3x^3 + 8x^2 - 2$   
 C)  $-2x^4 + 8x^2 + 2x - 2$   
 D)  $2x^2 - 8x - 2x + 2$   
 E) N.O.T.A.

11. Find the sum of the solutions of the equation  $\frac{x}{4} - \frac{5}{x} = \frac{1}{4}$ .

- A) -1    B) 1    C) 5 or -4    D) -5    E) N.O.T.A.

12. Solve the equation:  $\sqrt{-10x - 4} = 2x$ .

- A) 2 or  $\frac{1}{2}$     B) -2    C)  $-\frac{1}{2}$  or -2    D) no solution    E) N.O.T.A.

13. Solve:  $2x^2 + 5x - 11 = 0$ .

- A)  $\frac{-5 \pm \sqrt{113}}{4}$     B)  $\frac{-5 + \sqrt{69}}{4}$     C)  $\frac{-5 - \sqrt{69}}{4}$     D)  $\frac{5 \pm \sqrt{113}}{4}$

E) N.O.T.A.

14. Find the slope between the points  $(2, 2m)$  and  $(m, 4)$ .

- A) -2    B)  $-\frac{m}{2}$     C) 2    D)  $2m$     E) N.O.T.A.

15. Evaluate:  $\frac{(4.6 \times 10^8)(3.7 \times 10^{-5})}{(2.6 \times 10^{-3})(1.7 \times 10^6)}$ .

- A)  $\frac{1702}{221}$       B)  $\frac{851}{442}$       C)  $\frac{851}{221}$       D)  $\frac{1702}{442}$       E) N.O.T.A.

16. Evaluate:  $-1^2 - 6(3 + x) + 7 - 3^{-1} + (2 \div x)4$ .

- A)  $\frac{-43x + 24}{3x}$       B)  $\frac{-18x^2 - 37x + 24}{3x}$       C)  $\frac{-18x^2 - 31x + 24}{3x}$   
 D)  $\frac{-18x^2 - 31x - 24}{3x}$       E) N.O.T.A.

17. Solve for  $m$ :  $A = \frac{1}{2}d(m + f) - \frac{1}{8}m$ .

- A)  $\frac{2A - df}{d - 1}$       B)  $-8A + 4dm + 4df$       C)  $\frac{8A - 32df}{32d - 1}$       D)  $\frac{8A - 4df}{4d - 1}$       E) N.O.T.A.

18. Given:  $x^2 + y^2 = 16$  and  $xy = 4$ . Find  $|x - y|$ .

- A) 24      B) 12      C) 8      D) 0      E) N.O.T.A.

19. Given:  $g(x) = \frac{2x - 5}{x}$  and  $h(x) = 2x^2 - 3$ . Evaluate:  $\frac{[g(h(3))]}{[h(h(3))]}$ .

- A)  $\frac{g}{h}$       B) 1      C)  $\frac{1}{45}$       D)  $\frac{5}{1341}$       E) N.O.T.A.

20. Lucy needs 35 ounces of a 40% acid solution. She has 35 ounces of a 25% acid solution. How much of her current solution must be drained and replaced with pure acid in order to achieve her desired solution?

- A)  $8\frac{3}{4}$       B) 21      C) 7      D) 4.2      E) N.O.T.A.

21. Simplify:  $\left(\frac{-6z^3}{x^{-1}y^2}\right)^3 \left(\frac{x^{-3}z}{2y}\right)^{-2} \div \left(\frac{4}{xyz^0}\right)$

- A)  $\frac{-3456z^7x^8}{y^5}$       B)  $\frac{-216x^{10}z^7}{y^3}$       C)  $\frac{-216z^8x^{10}}{y^5}$       D)  $\frac{-27x^{10}z^7}{2y^5}$

E) N.O.T.A.

22. What is the minimum value of  $y = 2x^2 - 4x + 3$ ?

- A) no solution      B) -1      C) -4      D) 1      E) N.O.T.A.

23. Billy flipped a fair coin 4 times. What is the probability he gets a tail only once?

- A)  $\frac{3}{4}$       B)  $\frac{1}{16}$       C)  $\frac{1}{4}$       D)  $\frac{1}{2}$       E) N.O.T.A.

24. Simplify:  $\frac{2}{x+2} + \frac{3}{2(x+2)^2} - \frac{3}{x}$ .

- A)  $\frac{-2x^2 - 13x - 24}{2x(x+2)^2}$       B)  $\frac{-22x - 23}{2(x+2)^2}$       C)  $\frac{-2x^2 + 35x + 24}{2x(x+2)^2}$   
D)  $\frac{2x+1}{(x+2)^2}$       E) N.O.T.A.

25. If  $g$  = greatest common factor of 2000 and 1996 and  $m$  = least common multiple of 36 and 81, find the arithmetic mean of  $g$  and  $m$ .

- A) 164      B) 144      C) 328      D) 163      E) N.O.T.A.

### **TIEBREAKERS**

1. When  $(2x+y)^6$  is expanded, what is the coefficient of the term that contains  $x^3y^3$ ?

2. Evaluate:  $1+3+5+7+\dots-2001$

3. Simplify:  $\frac{2}{\sqrt[3]{2} + \sqrt[3]{3}}$