

# Summer Math Problems for Adv Math Honors

Factor completely

- ①  $15a^2b - 10ab^2$
- ②  $16x^2y^3 + 24xy^2$
- ③  $c^2 - 49$
- ④  $x^2 + 6x + 8$
- ⑤  $x^2 - 3x - 10$
- ⑥  $t^2 - 81$
- ⑦  $5x^2 - 20$
- ⑧  $2x^2 - 16x + 32$
- ⑨  $6x^2 - 11x - 2$
- ⑩  $16n^2 - 169$
- ⑪  $n^3 + 3n^2 - 54n$
- ⑫  $4a^2 + a - 3$
- ⑬  $x^2 - 8x + 16$
- ⑭  $x^3 - 25x$
- ⑮  $3x^2 - 300$
- ⑯  $3x^2 + 9x - 84$

Solve these equations/inequalities

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$$(17) \frac{2}{4x+1} + \frac{x}{3} = \frac{6}{12x+21}$$

$$(18) 3x^2 - 4x = 4$$

$$(19) x^2 + x + 1 = 0$$

$$(20) \sqrt{3x+4} - 2 = 5$$

$$(21) \sqrt{4x-3} = \sqrt{x}$$

$$(22) 5x^2 = 20x$$

$$(23) 8^{3x} = 16^{x-1}$$

$$(24) 9^{2x-5} = 3^4$$

$$(25) \frac{(x+4)(x-1)}{(x+5)(x+6)} > 0$$

Solve these systems

$$(26) \begin{cases} 3x - y = 4 \\ 2x + 5y = -3 \end{cases}$$

$$(27) \begin{cases} 3x + 2y = 6 \\ 4x - y = 8 \end{cases}$$

Simplify

$$(28) 4^{-3} - 13^0$$

$$(29) 36^{-\frac{1}{2}} + 125^{\frac{2}{3}}$$

$$(30) \sqrt{60}$$

$$\textcircled{31} \frac{6}{\sqrt{2}}$$

$$\textcircled{32} \frac{5}{2\sqrt{3}}$$

$$\textcircled{33} \sqrt{-63}$$

$$\textcircled{34} \sqrt{48} - 10\sqrt{75}$$

$$\textcircled{35} \sqrt{\frac{14}{5xy}}$$

$$\textcircled{36} \frac{(3ab^{-3})^{-2}(-a^4b^5)^4}{-2a^{-4}b}$$

$$\textcircled{37} \sqrt{-128x^6y^{23}}$$

$$\textcircled{38} (3-8a)^2$$

Use synthetic division to divide

$$\textcircled{39} \frac{3x^4 - 4x^2 + 7x - 8}{x+1}$$

$$\textcircled{40} \frac{4x^3 + 8x^2 - 5x + 1}{2x+1}$$

# Answers for Adv Math Honors Problems

- ①  $5ab(3a-2b)$   
 ②  $8xy^2(2xy+3)$   
 ③  $(c+7)(c-7)$   
 ④  $(x+4)(x+2)$   
 ⑤  $(x-5)(x+2)$   
 ⑥  $(t+9)(t-9)$   
 ⑦  $5(x+2)(x-2)$   
 ⑧  $2(x-4)(x-4)$   
 ⑨  $(6x+1)(x-2)$   
 ⑩  $(4n+13)(4n-13)$   
 ⑪  $n(n+9)(n-6)$   
 ⑫  $(4a-3)(a+1)$   
 ⑬  $(x-4)(x-4)$   
 ⑭  $x(x+5)(x-5)$   
 ⑮  $3(x+10)(x-10)$   
 ⑯  $3(x+7)(x-4)$   
 ⑰  $0, -\frac{7}{4}$   
 ⑱  $-\frac{2}{3}, 2$   
 ⑲  $\frac{-1 \pm i\sqrt{3}}{2}$   
 ⑳ 15  
 ㉑ 1  
 ㉒ 0, 4  
 ㉓  $-\frac{4}{5}$   
 ㉔  $\frac{7}{2}$   
 ㉕  $x < -6$  or  $-5 < x < -4$  or  $x > 1$
- ㉖ ~~(1, -1)~~  
 ㉗ (2, 0)  
 ㉘  $-\frac{63}{64}$   
 ㉙  $\frac{151}{6}$   
 ㉚  $2\sqrt{15}$   
 ㉛  $3\sqrt{2}$   
 ㉜  $\frac{5\sqrt{3}}{6}$   
 ㉝  $3i\sqrt{7}$   
 ㉞  $-46\sqrt{3}$   
 ㉟  $\frac{\sqrt{70xy}}{5xy}$   
 ㊱  $\frac{a^{18}b^{25}}{-18}$   
 ㊲  $8ix^3y\sqrt{2y}$   
 ㊳  $9-48a+64a^2$   
 ㊴  $3x^3-3x^2-x+8$  R-16  
 ㊵  $2x^2+3x-8$  R9