

Algebra II Team Solutions  
Miami Sunset Invitational - January 26, 2002

1.  $(1, -3), \left(\frac{5}{2}, 0\right), (0, 0)$ ; Taking 2 inequalities at a time, solve 3 systems.
2.  $35 + 11i$ ;  $A = -2 - 23i, B = 32 + 36i, C = 5 - 3i, D = i$ .
3. 3;  $V = lwh, 80x = (x+5)(2x+4)x, 80 = 2x^2 + 14x + 20; x^2 + 7x - 30 = 0; (x+10)(x-3) = 0; x = 3$ .
4.  $(x+7)(x-3)$ ;  $A = -13, B = 0, C = x^2 + x, D = 3x - 8$ . Sum is  $x^2 + 4x - 21$ .
5. 14.4;  $A. 3^{2x+4} = 3^{3x-3}$  so  $2x+4 = 3x-3, x = 7$   
 $B. (x+2)^{\frac{2}{3}} = 81$ , take each side to the  $\frac{3}{2}$  power gives  $x+2 = 729, x = 727$ .  $C. x = 34, -16 - 34 = -50$ .  
 $\frac{A-B}{C} = \frac{7-727}{-50} = 14.4$
6. 3; Simplify the denominator  $\frac{1}{\frac{1+x+1}{1+x}} = \frac{1}{2}$ ,  
 $\frac{1+x}{2+x} = \frac{1}{2}, x = 0; 3 + \frac{0}{3} = 3$
7.  $x^2 + 2x + 2$ ;  
 $\frac{(x-1)(x^2+x+1)}{2(2x+3)(2x+1)} \cdot \frac{(3x-8)(2x+3)}{(x+1)(x-1)} \cdot \frac{6(2x+1)(x+2)}{3(3x-8)(x+2)}$
8. -330;  $A x^2 - 6x + 9 + y^2 + 10y + 25 = 9$   
so radius is 3.  $B \frac{-b}{2a} = \frac{8}{4} = 2$  the  $x$ -coordinate of the vertex,  $y$ -coordinate is -6.  
 $C \log 100 = 2, \log(5 \cdot 2) = 1, 1^2 = 1$   
 $D \frac{9!}{6!3!} (2x)^6 (-y)^3 = -5376$ .  
 $\frac{-5376}{(3+1)^2} - (-6) = -330$
9.  $\sqrt{5}$ ;  $|3+i| = \sqrt{10}, |4+3i| = 5, |2+i| = \sqrt{5}$ ,  
 $|1-i| = \sqrt{2}, \frac{\sqrt{10+5}}{\sqrt{5+\sqrt{2}}} \cdot \frac{\sqrt{5-\sqrt{2}}}{\sqrt{5-\sqrt{2}}} = \frac{3\sqrt{5}}{3} = \sqrt{5}$
10. 41;  $A = \frac{1}{5}, B = 16, C = 36, D = 16$ .  
 $5 \cdot \frac{16}{16} + 36 = 41$
11.  $\frac{973}{216}$ ;  $A x^2 = 36, x = 6, B 6^{-3} = x, x = \frac{1}{216}$ ,  
 $C 3^x = \frac{1}{\sqrt{27}}, x = -\frac{3}{2}$ . Sum =  $\frac{973}{216}$
12. 6;  $147^{77}$  - powers of 7, pattern of 4 - 7, 9, 3, 1,  
 $\frac{77}{4}$  has remainder 1 so ends in 7  
 $73^{126}$  - powers of 3 has a pattern of 4 - 3, 9, 7, 1,  
 $\frac{126}{4}$  has remainder 2 so ends in 9  
 $208^{34}$  - powers of 8 has a pattern of 4 - 8, 4, 2, 6,  
 $\frac{34}{4}$  has remainder 2 so ends in 4  
 $112^{92}$  - powers of 2 has a pattern of 4 - 2, 4, 8, 6,  
 $\frac{92}{2}$  has no remainder so ends in 6  
Sum = 26, units digit 6
13.  $0; x + y = 16, y = 16 - x; \frac{3}{x} + \frac{3}{y} = \frac{4}{5}$ ,  
Substituting gives  $\frac{3}{x} + \frac{3}{16-x} = \frac{4}{5}$ .  
Solving the system gives  $x = 10, y = 6$ .  
 $30 - 30 = 0$
14. 18; Find the coordinates of the points where each pair of lines intersects.  
Substitute in  $c = 5x + 2y$  and find smallest value.
15. 1;  $\log 2 - \log 2x = 2 \log x, \log 2 - \log 2x = \log x^2$ ,  
 $\log \frac{2}{2x} = \log x^2, \frac{1}{x} = x^2, 0 = x^3 - 1$ ,  
 $0 = (x-1)(x^2+x+1)$ , only  $x-1 = 0$  gives a real root so  $x = 1, y = 0$ .