

5.3.73, 5.3.77,  
5.3.81

Exercises 5.3.73, 5.3.77, 5.3.81

Solve each equation:

$$(73) 3^{x^3} = 9^x, \quad (77) 3^{x^2-7} = 27^{2x}, \quad (81) e^{2x} = e^{5x+12}$$

Solution

(73) We have  $3^{x^3} = 9^x = (3^2)^x = 3^{2x}$ ,  
and since an exponential function is one-to-one  
then we have  $x^3 = 2x$ . This implies  
 $x^3 - 2x = x(x^2 - 2)$ . Therefore the solutions  
are  $\boxed{x = -\sqrt{2}, x = 0, \text{ and } x = \sqrt{2}}$ .

(77) We have  $3^{x^2-7} = 27^{2x} = (3^3)^{2x} = 3^{6x}$ ,  
and since an exponential function is one-to-one  
then we have  $x^2 - 7 = 6x$ . This implies  
 $x^2 - 6x - 7 = 0$  or  $(x+1)(x-7) = 0$ . Therefore the  
solutions are  $\boxed{x = -1 \text{ and } x = 7}$ .

(81) We have  $e^{2x} = e^{5x+12}$  and since an  
exponential function is one-to-one then  
we have  $2x = 5x + 12$ . This implies  
 $-3x = 12$  or  $\boxed{x = -4}$ .

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