

Remember MSIP assignment: p.371 #1-12 -- Due Tomorrow!!!

6.6 EXPONENTIAL EQUATIONS

An exponential equation contains a variable in the exponent.

ex. 1) $2^x = 32$ 2) $9^{x+1} = 27^x$ 3) $(0.8)^x = 0.18$

There are various methods used to solve them.

Method 1: Find a common base.

Rule: If $a^m = a^n$, then $m = n$ ($a > 0, a \neq 1$)

Ex. $4^x = 4^2$

$\therefore x = 2$

$$6. g) 0.01^{\frac{3}{2}}$$

$$= (\sqrt{0.01})^3$$

$$= (0.1)^3$$

$$= 0.001$$

$$8. D = 0.099 M^{\frac{9}{10}}$$

$$D = 0.099 (\sqrt[10]{M})^9$$

$$D = 0.099 (\sqrt[10]{35})^9$$

$$=$$

$$10. e) x^3 = \frac{27}{64}$$

$$x = \left(\frac{27}{64}\right)^{\frac{1}{3}}$$

$$x = \sqrt[3]{\frac{27}{64}} \rightarrow x = \frac{\sqrt[3]{27}}{\sqrt[3]{64}}$$

$$x = \frac{3}{4}$$

$$16^{\frac{3}{2}} = (\sqrt{16})^3$$

$$= \sqrt{16^3}$$

Ex. 1 Solve.

a) $5^x = 5^6$

$\therefore x = 6$

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$$\begin{aligned} 5^{2x} &= 5^3 \\ 2x &= 3 \\ x &= \frac{3}{2} \end{aligned}$$

b) $2^x = 16$

$2^x = 2^4$

$\therefore x = 4$

c) $5^{3x-4} = 25$

$5^{3x-4} = 5^2$

$\therefore 3x - 4 = 2$

$3x = 2 + 4$

$3x = 6$

$x = \frac{6}{3}$

$x = 2$

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$$+3x + 4 = +x - 9$$

$$3x - x = -9 - 4$$

$$2x = -13$$

$$x = \frac{-13}{2}$$

$$d) 3^{5x+8} = 27^x$$

1. Get bases the same

$$3^{5x+8} = (3^3)^x$$

2. Use exponent rules to simplify

$$3^{5x+8} = 3^{3x}$$

$$\therefore 5x + 8 = 3x$$

$$5x - 3x = -8$$

$$2x = -8$$

$$x = \frac{-8}{2}$$

$$x = -4$$

$$e) 2^{2(x-5)} = 4^{3x-1}$$

$$2^{2x-10} = (2^2)^{3x-1}$$

$$2^{2x-10} = 2^{6x-2}$$

$$\therefore 2x-10 = 6x-2$$

$$-10+2 = 6x-2x$$

$$-8 = 4x$$

$$-\frac{8}{4} = x$$

$$-2 = x$$

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Tomorrow

Method 2: Trial and Error (systematic trial)

Solve for x .

$$7^x = 101$$

$$7^2 = 49$$

$$7^3 = 343$$

x must be between 2 and 3. Try some values:

$$7^{2.1} = 59.53$$

$$7^{2.2} = 72.3 \quad \text{etc.}$$

$$\therefore x \doteq 2.4 \quad \text{p. 384 \#9}$$

Method 3: Solve by graphing -- we will wait until later.

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