Exponential Functions Problem Set

Attempt the following problems *without using a calculator.*

1. Find the value of:

   (a) e^0

   (b) $8^{-1/3}$

   (c) 2^{-5}

   (d) $\left(\frac{1}{4}\right)^{-3/2}$

   (e) $27^{-2/3}$

   (f) $2 \cdot 3^{5-4x}$, when $x = 2$

2. Solve for x:

   (a) $2^x = 0$

   (b) $e^x = -3$

   (c) $3^x = \frac{1}{9}$

   (d) $9^x = 27$

   (e) $e^x = 1$

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

   (g) $6^{2x-1} = 36$

   (h) $e^{4x^2-8} = e$

   (i) $4^{x-1} = 8^x$

   (j) $5^x = 25^{3x-1}$

3. Draw a sketch of the function $y = a^x$, if $a > 1$. Make a list of features that all graphs of this type have in common.

4. Simplify the expression $\dfrac{2e^{\frac{5x}{3}} + e^{\frac{2x}{3}}}{2e^{2x} + e^x}$, by first factoring out the greatest common factor from the numerator and from the denominator.

5. Use properties of exponents to simplify the expression $\dfrac{4e^x \cdot 4^{7x}}{e^{3-x}}$

Solutions

1. (a) 1

   (b) $\frac{1}{2}$

   (c) $\frac{1}{32}$

   (d) 8

   (e) $\frac{1}{9}$

   (f) $\frac{2}{27}$

2. (a) No solution (a^x is **never** negative and never 0)

   (b) No solution (exponentials can **only** give positive values)

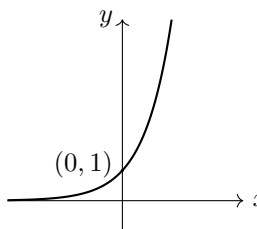   (c) $x = -2$

   (d) $x = \frac{3}{2}$

   (e) $x = 0$

   (f) $x = \sqrt{2}$ or $-\sqrt{2}$

   (g) $x = \frac{3}{2}$

   (h) $x = \frac{3}{2}$ or $-\frac{3}{2}$

   (i) $x = \frac{5}{2}$

   (j) $\frac{2}{5}$

3.

   - y-values are always positive
   - passes through the point $(0, 1)$
   - y-values are very small positive numbers when x is a large negative number (on the left of the graph)
   - y-values are very large positive numbeers when x is a large positive number (on the right of the graph)

4. $\dfrac{1}{e^{x/3}}$ or $e^{-x/3}$

5. $4^{7x+1}e^{2x-3}$