Math 30, Homework 6 on sections 3.1, 3.2

Write all your working out and answers on your own notepaper - no need to write the questions. Please use lots of space.

It is very important that you show clearly any work you had to do to get your answers. Just writing the answer down with no work shown is usually not enough. Do all 15 questions - they are worth 2 points each. Hand in your solutions next week only.

For these first 10 questions, *check that your answers match the solutions on page 3*. If you don't get the same answers then look at your notes or the book or ask me. Only do the last five questions when you are sure you understand the first ten.

(1) Compute: **(a)** 16^2,   **(b)** 16^0,   **(c)** $16^{1/2}$,   **(d)** 16^{-2}

(2) Sketch the graph of $f(x) = 3^x - 1$. Be sure to include the x and y intercepts and the horizontal asymptote.

(3) (a) Write the logarithmic form of $10^x = 20$

   (b) Write the logarithmic form of $y = 3^{-2}$

   (c) Write the exponential form of $\log_6 216 = w$

   (d) Write the exponential form of $\log_b 27 = 3$

(4) Evaluate these logarithms:

   (a) $\log_3 9$

   (b) $\log_2 128$

   (c) $\log_{10} 1$

   (d) $\ln e$

(5) Calculate:

   (a) $\log_2(1/8)$

   (b) $\log_5 \sqrt{5}$

   (c) $\log_7(7^{10})$

(6) Compute:

   (a) $2^{\log_2 7}$

   (b) $e^{\ln 15}$

(7) Let
$$f(x) = 5^{3x-7}$$
and find $f^{-1}(x)$.

(8) Sketch the graph of $\log_3 x$. Be sure to include the x intercept and the vertical asymptote.

(9) Let
$$g(x) = \log_4(2x + 9)$$
and find $g^{-1}(x)$.

(10) On a calculator, find correct to five decimal places:

    (a) e^5

    (b) $\log_{10} 20$

Five more questions. Show clearly all your working out and reasoning.

(11) **(a)** Write the logarithmic form of $2^{20} = 1048576$

    (b) Write the logarithmic form of $9 = b^y$

    (c) Write the exponential form of $\log_4 x = y$

    (d) Write the exponential form of $\ln 7 = w$

(12) Evaluate these logarithms:

    (a) $\log_5 125$

    (b) $\log_{17} 289$

    (c) $\log_{49} 7$

    (d) $\log_4(1/64)$

(13) Compute:

    (a) $\log_9(9^9)$

    (b) $7^{\log_7 2}$

(14) Let
$$f(x) = e^{16+3x}$$
and find $f^{-1}(x)$.

(15) Sketch the graphs of 4^x and $\log_4 x$ together. Be sure to include the x and y intercepts and the horizontal and vertical asymptotes.

Answers to questions (1)-(10):

(1) *(a)* $16^2 = 256$,   *(b)* $16^0 = 1$,   *(c)* $16^{1/2} = 4$,   *(d)* $16^{-2} = 1/256$

(2) This is the graph of $y = 3^x$, moved one unit down. It crosses the axes at $(0, 0)$ and approaches the horizontal line $y = -1$ on the left.

(3) *(a)* The logarithmic form of $10^x = 20$ is $\log_{10} 20 = x$

   (b) The logarithmic form of $y = 3^{-2}$ is $\log_3 y = -2$

   (c) The exponential form of $\log_6 216 = w$ is $6^w = 216$

   (d) The exponential form of $\log_b 27 = 3$ is $b^3 = 27$

(4) *(a)* $\log_3 9 = 2$

   (b) $\log_2 128 = 7$

   (c) $\log_{10} 1 = 0$

   (d) $\ln e = 1$

(5) *(a)* $\log_2(1/8) = -3$

   (b) $\log_5 \sqrt{5} = 1/2$

   (c) $\log_7(7^{10}) = 10$

(6) *(a)* $2^{\log_2 7} = 7$

   (b) $e^{\ln 15} = 15$

(7) The inverse is
$$f^{-1}(x) = \frac{7 + \log_5 x}{3}$$

(8) The graph of $\log_3 x$ may be seen as the reflection of $y = 3^x$ through the line $y = x$. It crosses the x axis at $x = 1$ and has vertical asymptote $x = 0$.

(9) The inverse is
$$g^{-1}(x) = \frac{4^x - 9}{2}$$

(10) *(a)* $e^5 \approx 148.41316$

   (b) $\log_{10} 20 \approx 1.30103$