

Think of a number, any number:

- 1) Choose your favorite number b/w 1 & 20.
- 2) Double it.
- 3) Add 10.
- 4) Divide by 2.
- 5) Subtract your starting number.

Write your result on your desk and cover it up.

Today's learning objective:

By the end of class, I will be able to solve logarithmic problems utilizing the full suite of log properties.

Today's language objective:

$$\frac{x^7}{x^3} = x^4$$

Division ~ subtraction

Multiplication ~ addition

Base → *The base is the base*

Input vs Output

all questions are non-calc

[Maximum mark: 13]

Solve the following equations.

(a) $\log_x 49 = 2$

$$x^2 = 49$$

$$\pm 7$$

[3 marks]

(b) $\log_2 8 = x$

$$2^x = 8$$

$$x = 3$$

[2 marks]

(c) $\log_{25} x = -\frac{1}{2}$

$$25^{-1/2} = x$$

$$= \frac{1}{25^{1/2}} = \frac{1}{\sqrt{25}} = \pm \frac{1}{5}$$

[5 marks]

(d) $\log_2 x + \log_2 (x-7) = 5$

[5 marks]

$$\log_2 x(x-7) = 3$$

$$\log_2 (x^2 - 7x) = 3$$

17.) Solve $\log_2 x + \log_2(x - 2) = 3$, for $x > 2$.

RTFQ

$$x = 4$$

74.) Let $f(x) = \log_a x, x > 0$.

(a) Write down the value of

(i) $f(a)$;

(ii) $f(1)$;

(iii) $f(a^4)$.

$$\log_a a = ? = 1 = a^1 = \cancel{a} \cancel{a^4}$$

0

4

88.) Find the **exact** value of x in each of the following equations.

(a) $5^{x+1} = 625 = 5^4$ $x = 3$

(b) $\log_a(3x + 5) = 2$

$$a^2 = 3x + 5$$

$$x = \frac{a^2 - 5}{3}$$

(Total

126.) Solve the equation $\log_{27} x = 1 - \log_{27} (x - 0.4)$.

$$\log_{27} x + \log_{27} (x - 0.4) = 1$$

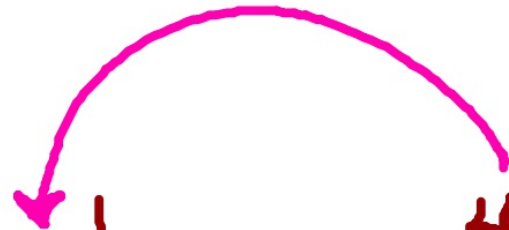
$$x^2 - 0.4x - 27 = 0$$

$$5x^2 - 2x - 135 = 0$$

145.) Solve the equation $\log_9 81 + \log_9 \frac{1}{9} + \log_9 3 = \log_9$

$$\log_9 27 = \log_9 x$$

$$x = 27$$


$$\log_{10} x^4 = 4 \log x$$

Do you like turducken?

Find the inverse for $y = 5x - 2$

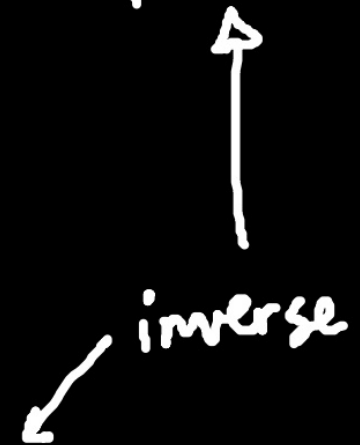
$$x = 5y - 2$$

+2

$$\frac{x+2}{5} = \frac{5y}{5}$$

$$\frac{x+2}{5} = y^{-1}$$

$$f^{-1}(x)$$



Today's learning objective:

By the end of class, I will be able to write inverse and composite functions and remind myself of logarithmic rules.

Today's language objective:

$$f^{-1}(x)$$

$$f(g(x))$$

$$(f \circ g)(x)$$

USA
int'l

[Maximum mark: 6]

The functions f and g are defined by $f(x) = 3x$, $g(x) = x + 2$.

- (a) Find an expression for $(f \circ g)(x) = 3(x+2) = 3x+6$ [2 marks]
- (b) Find $f^{-1}(18) + g^{-1}(18)$. [4 marks]

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Let $f(x) = k \log_2 x$.

(a) Given that $f^{-1}(1) = 8$, find the value of k .

$$x = k \log_2 y$$

(b) Find $f^{-1}\left(\frac{2}{3}\right)$.

$$x = \log_2 y^k$$

$$2^{2/3 \cdot 3} = y^{1/3 \cdot 3}$$

$$2^{6/3} = y$$

$$\boxed{4 = y}$$

$$2^x = y^k$$

$$2^1 = 8^k$$

$$k = 1/3$$

Consider the functions f and g where $f(x) = 2x - 3$ and $g(x) = x - 4$.

(a) Find the inverse function, f^{-1} and $g^{-1} = x + 4$

(b) Find $(g^{-1} \circ f)(x)$.

$$\frac{x+3}{2}$$

$$(2x-3)+4 = 2x+1$$

(c) Given that $(f^{-1} \circ g)(x) = \frac{x-1}{2}$, solve $(f^{-1} \circ g)(x) = (g^{-1} \circ f)(x)$.

$$\frac{x-1}{2} = 2x+1$$

$$x-1 = 4x+2$$

$$x = -1$$

Let $h(x) = \frac{f(x)}{g(x)}$, $x \neq 2$.

- (d) (i) Sketch the graph of h for $-3 \leq x \leq 8$ and $-2 \leq y \leq 8$, including
- (ii) Write down the equations of the asymptotes.

$$5 + 5 \ln 3 - 5 \ln 0.5$$

$$5 + 5 (\ln 3 - \ln 0.5)$$

$$\boxed{5 + 5 \ln 6} \approx 14.0$$

[Maximum marks 7]

Let $f(x) = \ln(x+2) + \ln 5$, for $x > -5$.

(a) Find $f^{-1}(x)$. $x = \ln_e(5y+10)$

$$\ln = \log_e$$

$$e^x = 5y+10$$
$$y = \frac{e^x - 10}{5}$$

Let $g(x) = e^x + 2$

(b) Find $(g \circ f)(x)$, giving your answer in the form $\underbrace{ax + b}$, where $a, b \in \mathbb{Z}$.

$$g \circ f = e^{(\ln(5x+10))} + 2$$

$$y = e^{\ln(5x+10)} + 2$$

$$y - 2 = e^{\ln(5x+10)}$$

$$\ln(y-2) = \ln(5x+10)$$

$$y-2 = 5x+10$$

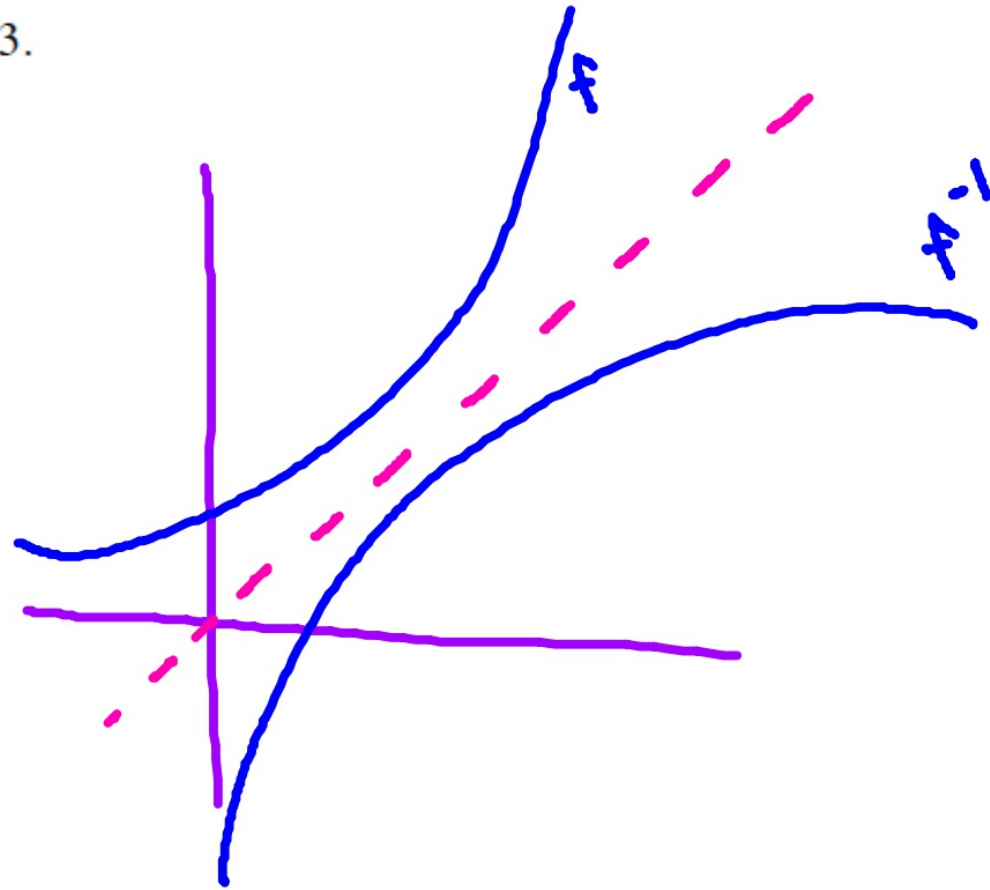
$$y = 5x+12$$

1.) Let $f(x) = 7 - 2x$ and $g(x) = x + 3$.

(a) Find $(g \circ f)(x)$.

(b) Write down $g^{-1}(x)$.

(c) Find $(f \circ g^{-1})(5)$.



(Tot

9.) Let $f(x) = \log_3 \frac{x}{2} + \log_3 16 - \log_3 4$, for $x > 0$.

non-calc

(a) Show that $f(x) = \log_3 2x$.

(b) Find the value of $f(0.5)$ and of $f(4.5)$.

0 2

The function f can also be written in the form $f(x) = \frac{\ln ax}{\ln b}$.

(c) (i) Write down the value of a and of b .

(ii) Hence on graph paper, **sketch** the graph of f , for $-5 \leq x \leq 5$, $-5 \leq y \leq 5$, using scale of 1 cm to 1 unit on each axis.

(iii) Write down the equation of the asymptote.

(d) Write down the value of $f^{-1}(0)$.

The point A lies on the graph of f . At A, $x = 4.5$.

(e) On your diagram, sketch the graph of f^{-1} , noting clearly the image of point A.