

KNOW
1-5
/25

Full Solution: Show ALL work to obtain full marks. **NO CALCULATOR IS PERMITTED.**

1. Express each of the following in the indicated form.

a) $\log_3(x+1) = y$ in exponential form

$$3^y = x+1$$

b) $b^{2x} = 5$ in logarithmic form

$$\log_b 5 = 2x$$

/K2

2. Use the laws of logarithms to express each of the following in terms of $\log_b x$, $\log_b y$, and $\log_b z$.

a) $\log_b \left(\frac{xz}{y} \right)$

$$= \log_b x + \log_b z - \log_b y$$

Restr. $x > 0$
 $z > 0$
 $y > 0$

b) $\log_b(x^2 z^7)$

$$= 2 \log_b x + 7 \log_b z$$

Restr. $x > 0$
 $z > 0$

c) $\log_b(\sqrt[5]{y^3 z})$

$$= \frac{3}{5} \log_b y + \frac{1}{5} \log_b z$$

Restr. $y > 0$
 $z > 0$

/K5

3. Rewrite as a single logarithm:

$$\frac{1}{2} \log_b x - \log_b w - \frac{3}{4} \log_b v$$

$$= \log_b x^{\frac{1}{2}} - \log_b w - \log_b v^{\frac{3}{4}}$$

$$= \log_b \frac{\sqrt{x}}{w \cdot \sqrt[4]{v^3}}$$

Restr. $x > 0$
 $w > 0$
 $v > 0$

/K3

4. Evaluate the following logarithms, if possible.

a) $\log_4 64$

$$= \log_4 4^3$$

$$= 3$$

b) $\log 0.00001$

$$= \log 10^{-5}$$

$$= -5$$

c) $\log_b 1$

$$= 0$$

d) $\log_3 \left(\frac{1}{9}\right)$

$$= \log_3 3^{-2}$$

$$= -2$$

e) $2^{\log_2 529}$

$$= 529$$

f) $\log_5 \sqrt[3]{125}$

$$= \log_5 \sqrt[3]{125}$$

$$= \log_5 5 = 1$$

g) $\log_3 54 + \log_3 \left(\frac{3}{2}\right)$

$$= \log_3 \frac{54 \cdot 3}{2}$$

$$= \log_3 81 = 4$$

h) $\log_5 0$

no solution.

i) $\log_6 40 - \log_6 10 + \log_6 9$

$$= \log_6 \frac{40 \cdot 9}{10}$$

$$= \log_6 36 = 2$$

5. Sketch $f(x) = 2\log_2(x-1) - 3$. Include the original/transformed table of values with the mapping rule.

$a=2, d=1, c=-3, k=1$

$k>0, d=1 \rightarrow x=1$

$y = \log_2 x$

x	y
$\frac{1}{4}$	-2
$\frac{1}{2}$	-1
1	0
2	1
4	2

x+1	2y-3
-1.25	-7
-1.5	-5
-2	-3
-3	-1
-5	1

V.O. $x=0$

V.O. $x=1$

X int: $2\log_2(x-1) - 3 = 0$

$$2\log_2(x-1) = 3$$

$$\log_2(x-1) = \frac{3}{2}$$

$$x-1 = 2^{\frac{3}{2}} \rightarrow x = 1 + 2^{\frac{3}{2}} = 2.83 + 1 = 3.83$$

Y int: $2\log(x-1) - 3 = 4$

$x \neq 0$ - doesn't exist

$D = \{x > 1\}$

$R = \{y \in \mathbb{R}\}$

