Name: Key GTID: _____

For the short answer problems on **this page** you do not need to show any work.

For everything else: Show all work and BOX your final answer for each problem. Answers with no work may receive partial or no credit. Simplify answers for full credit.

1a. (2 points) What is the domain and range of $y = 3(x-4)^2 - 5$?

D: $(-\infty, \infty)$

R: $[-5, \infty)$

1b. (2 points) What is the domain and range of $y = 2^{x-3} + 4$?

D: $(-\infty, \infty)$

R: $(4, \infty)$

1c. (2 points) Write the equation for the function which is obtained from the graph of $y = 4^x$ after being transformed by shifting 2 units up and shifting 1 units left.

$y = 4^{x+1} + 2$

2. (5 points) Write in standard form (*i.e.*, vertex form): $y = 2x^2 - 16x + 22$

$y = 2(x^2 - 8x) + 22$

$\Rightarrow \quad y = 2(x^2 - 8x + 16 - 16) + 22$

$= 2(x^2 - 8x + 16) - 32 + 22$

$\boxed{y = 2(x-4)^2 - 10}$

3. (5 points) Find the quotient: $(x^3 - x^2 - 10x + 6) \div (x + 3)$
Hint: check your answer.

$$
\begin{array}{r}
x^2 - 4x + 2 \quad \text{R.0} \\
x+3 \;\overline{)\; x^3 - x^2 - 10x + 6} \\
-(x^3 + 3x^2) \\
\hline
-4x^2 - 10x + 6 \\
-(-4x^2 - 12x) \\
\hline
2x + 6 \\
-(2x + 6) \\
\hline
0
\end{array}
$$

quotient is

$\boxed{x^2 - 4x + 2}$

4. (6 points) For this problem use the function $f(x) = \dfrac{x^2-4}{(3x-1)(x+1)}$.

Find the domain of $y = f(x)$, the VA(s), the HA, the x-intercept(s), and the y-intercept.

domain is where denominator is nonzero

$(3x-1)(x+1)=0$

$\Rightarrow 3x-1=0 \Rightarrow x=1/3$ or $x+1=0$ or $x=-1$

VA is where denominator is zero but numerator is nonzero (no hole)

HA is leading coeff of numerator ÷ leading coeff of denominator (if deg is same)

So $\dfrac{1x^2-4}{(3x-1)(x+1)} = \dfrac{1x^2-4}{3x^2+2x-1}$

so $\boxed{y=1/3}$

x-intercept is where numerator is zero

$x^2-4=0 \Rightarrow (x-2)(x+2)=0 \rightarrow x=\pm 2$

y-intercept is where $x=0$ $\dfrac{0-4}{(0-1)(0+1)} = \dfrac{-4}{-1} = 4$

So $y=4$

D:	$(-\infty,-1) \cup (-1,1/3) \cup (1/3,\infty)$
VA(s):	$x=1/3$ and $x=-1$
HA:	$y=1/3$
x-int:	$x=2$ and $x=-2$
y-int:	$y=4$

5. (4 points) Evaluate: $\log_2(\sqrt{8})$

$\log_2(\sqrt{8}) = \log_2(8^{1/2})$

$= \frac{1}{2}\log_2(8) = \frac{1}{2} * 3 = \boxed{3/2}$

and $\log_2(8) = y \iff 2^y = 8$ so $y = 3$.

6. (4 points) Solve: $\log_3(2x + 4) = 0$

$\log_3(y) = 0 \Rightarrow y = 1$.

So $2x + 4 = 1$

$\Rightarrow 2x = -3$

$\Rightarrow \boxed{x = -3/2}$

7. (5 points) Evaluate: $\log_5\left(\frac{25x^2}{\sqrt{y}}\right)$, given $\log_5(x) = 3$ and $\log_5(y) = 10$.

$$\log_5\left(\frac{25x^2}{\sqrt{y}}\right) = \log_5(25) + \log_5(x^2) - \log_5(\sqrt{y})$$

$$= 2 + 2\log_5(x) - \frac{1}{2}\log_5(y)$$

$$= 2 + 2*3 - \frac{1}{2}*10$$

$$= 2 + 6 - 5 = \boxed{3}$$

8. (4 points) You deposit \$4,000 at 8% compounded quarterly for 6 years. How much will be in your account after 6 years?
Note: you must clearly set up the problem, but you do not need evaluate the expression.

$$A = P\left(1 + \frac{r}{n}\right)^{rt}$$

$P = 4000$
$r = 0.08$
$n = 4$
$t = 6$

$$A = 4000\left(1 + \frac{0.08}{4}\right)^{4\cdot 6}$$

$$\boxed{A = 4000(1.02)^{24}}$$

9. (6 points) Solve: $\log_2(x+2)+\log_2(x+3)=1$

$\log_2\left((x+2)(x+3)\right)=1$

$\Rightarrow \quad 2^1=(x+2)(x+3)$

$\Rightarrow \quad 2=x^2+5x+6$

$\Rightarrow \quad x^2+5x+4=0 \Rightarrow (x+4)(x+1)=0$

$x=-1$, $x=-4$?

Check @ $x=-1$

$\log_2(-1+2)+\log_2(-1+3)$

$=\log_2(1)+\log_2(2)$

$=0+1=1$ ✓

@ $x=-4$

$\log_2(-4+2)+\log_2(-4+3)$

is DNE

$\boxed{x=-1}$

10. (5 points) Sketch: $y=\log_2(x)$. Label any intercepts, label the axes and the curve, and identify and include a total of at least four points on your graph for full credit.

x	y
$1/2$	-1
1	0
2	1
4	2