Name: _____ *Key*

Period: _____

No Calculators!!

Simplify as much as possible.

1. $\dfrac{5^{n+3} + 5^{n-1}}{5^{n+1}}$ $= \dfrac{5^{n+3}}{5^{n+1}} + \dfrac{5^{n-1}}{5^{n+1}}$

$= 5^2 + 5^{-2}$

$= 25 + \dfrac{1}{25} = \dfrac{(25)^2 + 1}{25} = \boxed{\dfrac{626}{25}}$

2. $\dfrac{\frac{1}{8}}{\frac{3}{2}} = \dfrac{\frac{2}{1}}{8 \cdot 3} = \boxed{\dfrac{1}{12}}$

3. $4^n\left(\dfrac{n-2}{n}\right) - 4^{n+1}\left(\dfrac{n+1}{n}\right)$

$= \dfrac{4^n}{n}(n-2) - 4 \cdot \dfrac{4^n}{n}(n+1) = \dfrac{4^n}{n}\left[n-2 - 4n - 4\right] = \boxed{\dfrac{4^n}{n}(-3n-6)}$ OR $\boxed{\dfrac{-3 \cdot 4^n}{n}(n+2)}$

Solve for x.

1. $\left(\dfrac{1}{3}\right)^{x+2} = \sqrt[4]{3}$

$\Rightarrow 3^{-(x+2)} = 3^{\frac{1}{4}}$

$\Rightarrow -x-2 = \dfrac{1}{4}$

$\Rightarrow -x = 2 + \dfrac{1}{4} = \dfrac{9}{4}$

$\boxed{x = -\dfrac{9}{4}}$

2. $8^{(3-x)} = \left(\dfrac{1}{32}\right)^{2x+5}$

$\Rightarrow 2^{3(3-x)} = 2^{-5(2x+5)}$

$\Rightarrow 9 - 3x = -10x - 25$

$\Rightarrow 7x = -34 \Rightarrow \boxed{x = \dfrac{-34}{7}}$

3. $5^x - 2(5^x) - 80 = 0$

$-5^x = 80$

$5^x = -80$

$\Rightarrow \boxed{\text{No solution}}$

4. $7^x - 7^{x+1} = -12$

$7^x - 7 \cdot 7^x = -12$

$-6 \cdot 7^x = -12$

$7^x = 2$

$x = \boxed{\dfrac{\log 2}{\log 7}}$ OR $\boxed{\log_7 2}$ OR $\boxed{\dfrac{\ln 2}{\ln 7}}$

5. Given $y = 2^{-x} - 5$.

a) Sketch the graph showing the x-intercept, y-intercept, and the horizontal asymptote.

x-intercept: $(y=0) \Rightarrow 0 = 2^{-x} - 5 \Rightarrow 2^{-x} = 5 \Rightarrow \frac{1}{2^x} = 5 \Rightarrow 2^x = \frac{1}{5}$

y-intercept $(x=0) \Rightarrow y = 2^0 - 5 = 1 - 5 = \boxed{-4}$

H-Asymptote $\boxed{y = -5}$

$x = \left(\log_2\left(\frac{1}{5}\right)\right)$
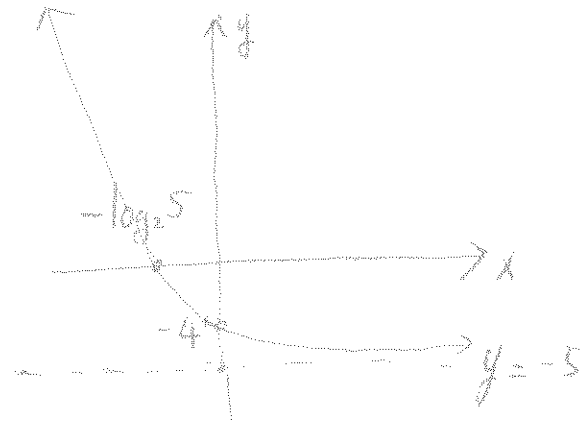
OR $\boxed{-\log_2 5}$

b) State the domain and range.

Domain: $\boxed{x \in \mathbb{R}}$ $(-\infty, \infty)$

Range $\boxed{y > -5}$ $(-5, \infty)$

c) Write the equation of the horizontal asymptote.

$\boxed{y = -5}$

6. Find the equation of the function and describe the transformation of the parent function $y = a^x$, where a is a positive integer.

$y = -a^x + 6$

$\Rightarrow$

$(1, 4)$

$4 = -a + 6$

$a = 2$

$\Rightarrow \boxed{y = -2^x + 6}$ $\Leftarrow$ Transformation

check $-2 = -(-2)^3 + 6$

$(3, -2)$ $-2 = -8 + 6 = -2$

① $y = 2^x$ is reflected over X-axis

② and verbally shifted 6 units up.