Serial #: ________ ID ______________ NAME ____

Show all necessary steps for full marks.

Q1. (5 points): (4.1 Recitation Q2): If $f(x) = ax + 12$ and $f^{-1}(-2) = 3$ then find $f(2)$

Solution:

$$f^{-1}(-2) = 3 \;\Rightarrow\; f\left(f^{-1}(-2)\right) = f(3) \;\Rightarrow\; -2 = f(3) \;\Rightarrow\; -2 = a(3) + 12 \;\Rightarrow\; -14 = 3a$$

$$\Rightarrow\quad a = -\frac{14}{3}$$

$$f(x) = ax + 12 = -\frac{14}{3}x + 12$$

$$f(2) = -\frac{14}{3}(2) + 12 = \frac{-28}{3} + 12 = \frac{-28 + 36}{3} = \frac{8}{3}$$

Answer: $\frac{8}{3}$

Q2. (5 points): (4.1 Additional Exercise 14) Given $f(x) = \frac{1}{5}x^2 - \frac{4}{25}x + k$ where $x \geq 2$. If $f^{-1}(2) = 5$ then find $k = ?$

Solution:

21. Given $f(x) = \frac{1}{5}x^2 - \frac{4}{25}x + k$, where $x \geq 2$. If $f^{-1}(2) = 5$, then k is equal to

(a) $-\frac{11}{5}$

(b) $-\frac{31}{5}$

(c) $\frac{31}{5}$

(d) $\frac{11}{5}$

(e) $\frac{1}{5}$

$$f^{-1}(2) = 5 \Rightarrow f(5) = 2$$

$$\Rightarrow \frac{1}{5} \cdot 25 - \frac{4}{25} \cdot 5 + k = 2$$

$$\Rightarrow 5 - \frac{4}{5} + k = 2$$

$$\Rightarrow k = 2 - 5 + \frac{4}{5}$$

$$= -3 + \frac{4}{5}$$

$$= \frac{-11}{5}$$

Q3. (5 points): (4.2 Additional Exercise 26): If $f(x)=\left(\frac{2}{3}\right)^{2-3x}$ is written as $f(x)=ka^{x}$, then $8a-27k=?$

Solution:

$$f(x)=\left(\frac{2}{3}\right)^{2-3x}$$
$$=\left(\frac{2}{3}\right)^{2}\left(\frac{2}{3}\right)^{-3x}$$
$$=\frac{4}{9}\left[\left(\frac{3}{2}\right)^{3}\right]^{x}$$
$$=\frac{4}{9}\left(\frac{27}{8}\right)^{x}$$
$$\Rightarrow\ k=\frac{4}{9}\ \text{and}\ a=\frac{27}{8}$$
$$8a-27k=8\left(\frac{27}{8}\right)-27\left(\frac{4}{9}\right)=27-12=15$$

Q4. (5 points): (4.2 Textbook Example 6): Solve $x^{4/3}=81$.

Solution:

EXAMPLE 6 **Solving an Equation with a Fractional Exponent**

Solve $x^{4/3}=81$.

SOLUTION Notice that the variable is in the base rather than in the exponent.

$x^{4/3}=81$	
$(\sqrt[3]{x})^{4}=81$	Radical notation for $a^{m/n}$ (Section R.7)
$\sqrt[3]{x}=\pm 3$	Take fourth roots on each side. Remember to use $\pm$. (Section 1.6)
$x=\pm 27$	Cube each side.

Check *both* solutions in the original equation. Both check, so the solution set is $\{\pm 27\}$.

Alternative Method There may be more than one way to solve an exponential equation, as shown here.

$x^{4/3}=81$	
$(x^{4/3})^{3}=81^{3}$	Cube each side.
$x^{4}=(3^{4})^{3}$	Write 81 as 3^4.
$x^{4}=3^{12}$	$(a^{m})^{n}=a^{mn}$
$x=\pm\sqrt[4]{3^{12}}$	Take fourth roots on each side.
$x=\pm 3^{3}$	Simplify the radical.
$x=\pm 27$	Apply the exponent.

The same solution set, $\{\pm 27\}$, results.