***AAT (IC/HW)-Day 1**
Chapter 5: 5-1 Exponential Functions

Name Key
Date: 9 Period: _____

Solve the equation.

1. $7^{x+6} = 7^{3x-4}$

$x+6 = 3x-4$

$\frac{10}{2} = \frac{2x}{2}$

$5 = x$

2. $3^{2x+3} = 3^{(x^2)}$

$2x+3 = x^2$

$0 = x^2 - 2x - 3$

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

$x = 3, -1$

3. $2^{-100x} = (0.5)^{x-4}$

$2^{-1(100x)} = \left(\frac{1}{2}\right)^{x-4}$

$\left(\frac{1}{2}\right)^{100x} = \left(\frac{1}{2}\right)^{x-4}$

$100x = x - 4$

$99x = -4$

$x = -\frac{4}{99}$

4. $4^{x-3} = 8^{4-x}$

$(2^2)^{x-3} = (2^3)^{4-x}$

$2^{2x-6} = 2^{12-3x}$

$2x - 6 = 12 - 3x$

$5x = 18$

$x = \frac{18}{5}$

5. $4^x \cdot \left(\frac{1}{2}\right)^{3-2x} = 8 \cdot (2^x)^2$

$2^{2x} \cdot (2^{-1})^{3-2x} = 2^3 \cdot 2^{2x}$

$2^{2x-3+2x} = 2^{3+2x}$

$4x - 3 = 3 + 2x$

$2x = 6$

$x = 3$

6. $8^{2x} \cdot \left(\frac{1}{4}\right)^{x-2} = 4^{-x} \cdot \left(\frac{1}{2}\right)^{2-x}$

$(2^3)^{2x} \cdot (2^{-2})^{x-2} = (2^2)^{-x} \cdot (2^{-1})^{2-x}$

$2^{6x} \cdot 2^{-2x+4} = 2^{-2x} \cdot 2^{-2+x}$

$2^{6x-2x+4} = 2^{-2x-2+x}$

$4x + 4 = -x - 2$

$5x = -6$

$x = -\frac{6}{5}$

7. $2^{3x-1} = \frac{1}{2}$

$2^{3x-1} = 2^{-1}$

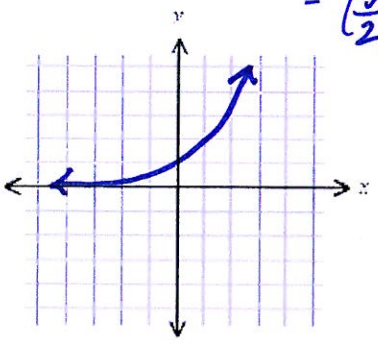
$3x - 1 = -1$

$3x = 0$

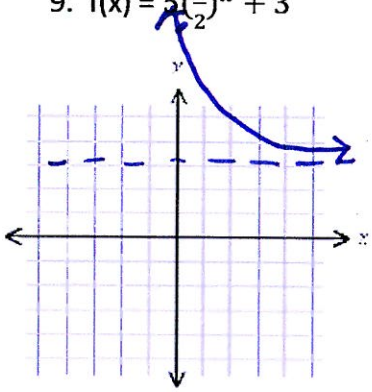
$x = 0$

Sketch the graph of f.

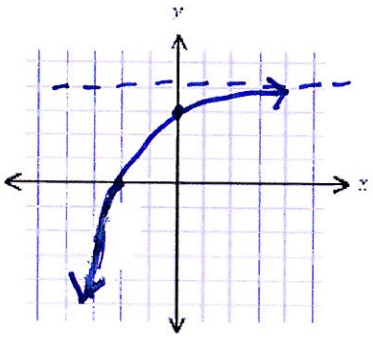
8. $f(x) = \left(\frac{2}{5}\right)^{-x}$; $f(x) = \left(\left(\frac{2}{5}\right)^{-1}\right)^x = \left(\frac{5}{2}\right)^x$



9. $f(x) = 5\left(\frac{1}{2}\right)^x + 3$



10. $f(x) = -\left(\frac{1}{2}\right)^x + 4$



11. One hundred elk, each 1 year old, are introduced into a game preserve. The number N(t) alive after t years is predicted to be $N(t) = 100(0.9)^t$. Estimate the number alive after

(a) 1 year

$N(1) = 100(0.9)^1$

$= 90$

(b) 5 years

$N(5) = 100(0.9)^5$

≈ 59

(c) 10 years

$N(10) = 100(0.9)^{10}$

≈ 35

12. A drug is eliminated from the body through urine. Suppose that for an initial dose of 10 milligrams, the amount A(t) in the body t hours later is given by $A(t) = 10(0.8)^t$.

(a) Estimate the amount of the drug in the body 8 hours after the initial dose.

$A(t) = 10(0.8)^t$

$A(8) = 10(0.8)^8 \approx 1.68 \text{ mg}$

(b) What percentage of the drug still in the body is eliminated each hour?

$A(t+1)$ = amt in body one hour after $A(t)$

$$\frac{A(t+1)}{A(t)} = \frac{10(0.8)^{t+1}}{10(0.8)^t} = 0.8^{t+1-t} = 0.8$$

80% remains
20% eliminated

13. If a savings fund pays interest at a rate of 10% per year compounded semiannually, how much money invested now will amount to $5000 after 1 year?

$A = 5000$

$$5000 = P\left(1 + \frac{.10}{2}\right)^{2 \cdot 1}$$

$$P = \frac{5000}{(1.05)^2} \approx \$4535.15$$

14. If a certain make of automobile is purchased for C dollars, its trade-in value V(t) at the end of t years is given by $V(t) = 0.78C(0.85)^{t-1}$. If the original cost is $10,000, calculate, to the nearest dollar, the value after

(a) 1 year

$V(t) = .78(10{,}000)(.85)^{t-1}$

$= 7800(.85)^{t-1}$

$V(1) = 7800(.85)^{1-1}$

$V(1) = \$7800$

(b) 4 years

$V(4) = 7800(.85)^{4-1}$

$V(4) = \$4790$

(c) 7 years

$V(7) = 7800(.85)^{7-1}$

$V(7) = \$2942$