

Instructions: This homework is an individual effort. Answer each question. This is due on **Monday, February 3rd**. **Show all work to receive full credit.**

1. Determine if the tables below can be modeled by a linear function, exponential, or neither. Justify your answer. If linear, give a function representing the values in the table. If exponential, give a function representing the values in the table.

(a) Table 1.

| | | | | |
|--------|----|----|----|----|
| x | 0 | 2 | 3 | 5 |
| $f(x)$ | 20 | 26 | 29 | 35 |

(b) Table 2.

| | | | | |
|--------|---|------|-------|---------|
| x | 0 | 1 | 2 | 3 |
| $f(x)$ | 7 | 2.24 | .7168 | .229376 |

(c) Table 3.

| | | | | |
|--------|----|----|----|----|
| x | 0 | 1 | 2 | 3 |
| $f(x)$ | 28 | 25 | 22 | 20 |

2. Simplify the following expressions. This means to have one exponential expression or one logarithmic expression via rules of logs and exponentials, factored, and no negative exponents.

(a) $\frac{3}{2} \ln(x) + \frac{1}{2} \ln(x^2) - (2 \ln(y) - 3 \ln(y))$

(b) $72 \ln(1) + \ln(x^2 - 1) + \ln(24) - \ln(x - 1) - \ln(8) - \ln(x + 1)$

(c) $\frac{(4^3)^4 \cdot 2^{-10}}{8^3 \cdot 16^2}$

(d) $(3^3 \cdot 27^{-3})^{-2}$

3. When George was 20 he had the best arm in New England. He could throw the ball 95 mph! However, as George aged on, he lost velocity on his fastball exponentially and, by 32, he was throwing the ball 78 mph. Now everyone could hit off him!

a. George wants to come up with a function to model his velocity decrease where it starts at the age of 18. Help George out!

b. Tell George the decay rate and the velocity he threw when he was 18! (He wants to reminisce on the glory days)

c. George wants to know the velocity he will have at 35. Let George know (in the nicest way possible) that he probably should quit pitching and give him the velocity.

4. Let $f(x) = 3x^2 - x$ and $g(x) = 4x - 2$. Find the following:

a. $f(x + 1)$

b. $f(x + 1) - f(x)$

c. $f(x) - g(x)$

d. $f(x + h) - f(x)$

5. Consider the function $f(x) = x^3$. Write in the words the transformations occurring for each.

a. $3f(x - 1)$

b. $-f(x) + 2$

c. $-2(f(x) - 2)$

d. $\frac{-1}{2}f(x)$

6. Graph one of the above transformations.

7. Write each of the following functions as a composition of $f(x) = |x|$, $g(x) = x - 7$, and $h(x) = x^2$.
- $F(x) = x^2 - 7$
 - $P(x) = |x - 7| - 7$
 - $D(x) = x^8$
8. Bruce Banner is notorious for being the hulk! Bruce “hulk’s out” to a surface area of 117760 cm^2 when his body mass is 128 lbs. It’s obvious Bruce is a pretty small guy and a scientist wants to know what would happen if a much larger person (or smaller person) were to “hulk out”. With the help of Iron Man’s computer system, Jarvis, the scientist comes up with the formula $S = kM^{10/7}$ where S is surface area for hulk, M is mass before “hulking out”, and k is the constant of proportionality. Jarvis is rusty on its precalculus and leaves it to the scientist to figure out the rest. However, the scientist skipped precalculus!
- The scientist asks you to find the constant of proportionality.
 - The scientist also asks you to use the above to determine the surface area of a person with a mass of 250 pounds.