

- 1) In the following tables decide whether the function is exponential, linear or neither. Then Find the proper function.

(Please very clearly show all of the mathematical steps)

(2 points Each)

a)

| | | | | | |
|------|----|----|---|---|------|
| x | 0 | 1 | 2 | 3 | 4 |
| f(x) | 64 | 16 | 4 | 1 | 0.25 |

Handwritten annotations: Curved arrows connect (0,64) to (1,16), (1,16) to (2,4), (2,4) to (3,1), and (3,1) to (4,0.25). Below each arrow is the multiplier $\ast \frac{1}{4}$.

Exponential
 $f(x) = 64\left(\frac{1}{4}\right)^x$

b)

| | | | | | |
|------|----|---|----|----|----|
| x | -1 | 1 | 2 | 3 | 4 |
| f(x) | 6 | 8 | 24 | 25 | 26 |

Handwritten annotations: Curved arrows connect (-1,6) to (1,8), (1,8) to (2,24), and (2,24) to (3,25). Below the arrows are the differences +2, +16, and +1.

Neither

c)

| | | | | | | |
|------|----|---|---|----|----|----|
| x | -1 | 0 | 1 | 2 | 3 | 4 |
| f(x) | 4 | 6 | 8 | 10 | 12 | 14 |

Handwritten annotations: Curved arrows connect (-1,4) to (0,6), (0,6) to (1,8), (1,8) to (2,10), (2,10) to (3,12), and (3,12) to (4,14). Below each arrow is the difference +2.

Linear
 $y = 2x + 6$

- 2) Find the inverse of the following functions

(4 points)

a) $f(x) = 7x - 105$

b) $f(x) = x^3 - 8$

$$y = 7x - 105$$

$$y = x^3 - 8$$

$$7x = y + 105$$

$$y + 8 = x^3$$

$$x = \frac{y + 105}{7}$$

$$\sqrt[3]{y + 8} = x$$

$$f^{-1}(x) = \frac{x + 105}{7}$$

$$f^{-1}(x) = \sqrt[3]{x + 8}$$

3) Some values for the function f is shown in the table below. (1/2 points each)

| | | | | |
|--------|---|---|---|---|
| x | 0 | 1 | 2 | 3 |
| $f(x)$ | 3 | 2 | 1 | 0 |

| | | | | |
|--------|---|---|---|---|
| x | 0 | 1 | 2 | 3 |
| $g(x)$ | 1 | 2 | 3 | 0 |

a) Find $(f \circ g)(0)$

$$= f(g(0))$$

$$= f(1) = 2$$

b) Find $(g \circ f)(1)$

$$g(f(1)) =$$

$$g(2) = 3$$

c) Find $(f \circ g^{-1})(3)$

$$f(g^{-1}(3)) = f(2) = 1$$

d) Find $(g \circ f^{-1})(1)$

$$g(f^{-1}(1)) = g(2) = 3$$

Evaluate the following.

(1 points each)

4a) Write the equation $b^M = c$ in logarithmic form.

$$\log_b c = M$$

4b) Write the equation $\log_7(X) = -1$ in exponential form.

$$7^{-1} = X \Rightarrow X = \frac{1}{7}$$

5) Given $f(x) = 3x - 7$ and $g(x) = 5 - 2x - x^2$

(1 points each)

a) Find $f(-3) = 3(-3) - 7 = -9 - 7 = -16$

b) $g(-2) = 5 - 2(-2) - (-2)^2 = 5 + 4 - 4 = 5$

c) Find x value when $f(x) = 2$ $2 = 3x - 7 \Rightarrow 3x = 9$ $x = 3$

d) Find x intercept of $f(x)$ $0 = 3x - 7$

$$\left(\frac{7}{3}, 0\right)$$

$$x = \frac{7}{3}$$

e) Find y intercept of $f(x)$

$$(0, -7)$$

f) Find $(f \circ g)(x) = f(5 - 2x - x^2) = 3(5 - 2x - x^2) - 7$

$$= 15 - 6x - 3x^2 - 7$$

$$= -3x^2 - 6x + 8$$

$$\begin{array}{r} -49 \\ +14 \\ \hline 35 \end{array}$$

g) Find $(g \circ f)(x)$

$$= g(3x - 7)$$

$$= 5 - 2(3x - 7) - (3x - 7)^2$$

$$= 5 - 6x + 14 - (9x^2 - 42x + 49) = -9x^2 + 36x - 35$$

Find the indicated composite for the pair of functions.

1) $f(x) = -3x + 6$; $g(x) = 6x + 4$

Find $(g \circ f)(x)$.

$$= g(-3x + 6)$$

$$= 6(-3x + 6) + 4$$

$$= -18x + 36 + 4 = -18x + 40$$

If C dollars are deposited in an account paying r percent annual interest, approximate to the nearest cent the amount in the account after x years. Write formula with symbols, substitute numbers and evaluate. The answer must contain units

2) $C = \$12,000$, $r = 3\%$, $x = 14$ years

$$A = C(1+r)^x$$

$$A = 12000(1+0.03)^{14}$$

$$= 12000(1.03)^{14}$$

Evaluate $f(x)$ at the given value of x. Approximate the answer to 8 decimal places.

3) $f(x) = e^x$, use the calculator to find $f(2.6) =$

$$f(2.6) = e^{2.6} =$$

Complete numerical representations for the functions f and g are given. Evaluate the expression, if possible.

4) $(g \circ f)(1)$

| | | | | |
|------|----|---|---|----|
| x | 1 | 6 | 8 | 12 |
| f(x) | -4 | 8 | 2 | 12 |

$$g(f(1)) = g(-4) = -6$$

| | | | | |
|------|----|----|---|---|
| x | -5 | -4 | 1 | 3 |
| g(x) | 1 | -6 | 6 | 8 |

Use the table to write a table of values for $f^{-1}(x)$.

5)

| | | | | |
|------|----|----|----|----|
| x | -7 | 7 | 3 | -3 |
| f(x) | 3 | -3 | -1 | 1 |

| | | | | |
|-------------|----|----|----|----|
| x | 3 | -3 | -1 | 1 |
| $f^{-1}(x)$ | -7 | 7 | 3 | -3 |

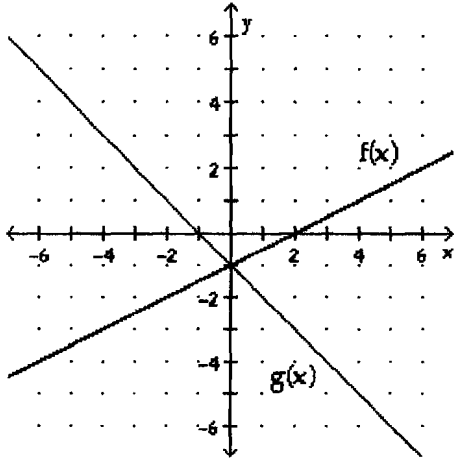
Use properties of exponents to simplify the expression.

6) $\frac{a^4 a^{-8}}{a^5}$

$$\frac{a^{-4}}{a^5} = a^{-9} = \frac{1}{a^9}$$

Use the graph to evaluate the expression.

7) $(g \circ f)(4)$



$$\begin{aligned} &(g \circ f)(4) \\ &= g(f(4)) = \\ &= g(1) = -2 \end{aligned}$$

Find a formula for the inverse. Show procedure.

8) $f(x) = \frac{4x - 4}{5}$

$$y = \frac{4x - 4}{5} \implies 5y = 4x - 4 \implies x = \frac{5y + 4}{4}$$

$$f^{-1}(x) = \frac{5x + 4}{4}$$

State whether the function illustrates exponential growth or exponential decay.

SKETCH the graph (no calculator). Label the y-intercept)

9) (a) $f(x) = 4e^{0.6x}$

GROWTH OR DECAY?

The y-intercept is $(0, 4)$

(b) $f(x) = 1.4e^{-1.3x}$

GROWTH OR DECAY?

The y-intercept is $(0, 1.4)$

(c) $f(x) = 2(8)^{-x}$

GROWTH OR DECAY?

The y-intercept is $(0, 2)$

(d) $f(x) = 1.4^x$

GROWTH OR DECAY?

The y-intercept is $(0, 1)$