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MATH 111-I
Spring 2025
Quiz 9

Problem 1: Determine whether the table below could represent an exponential function, $f(x)$. Be sure to justify why or why not.

x	1	2	3	4
$f(x)$	3	4.5	6.75	10.125

This can represent an exponential function. An exponential function is a function which has a constant ratio between terms. Observe that $\frac{4.5}{3} = 1.5$, $\frac{6.75}{4.5} = 1.5$, *and* $\frac{10.125}{6.75} = 1.5$. *That is, each subsequent term is obtained by taking the previous value and multiplying by* 1.5. *In fact,* $f(x) = 2(1.5)^x$.

Problem 2: Consider the function $f(x) = 7(1.38)^x$.

(a) Determine A and b for this exponential function.

An exponential function has the form Ab^x. *Observe that here* $A = 7$ *and* $b = 1.38$.

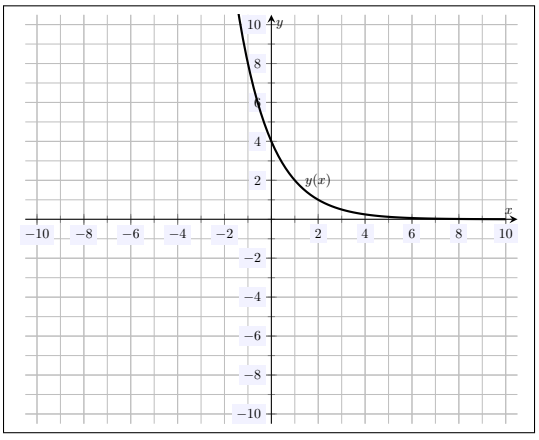
(b) What is the y-intercept for $f(x)$?

The y*-intercept for an exponential function is the* A*-value. From (a), we know that* $A = 7$. *Therefore, the* y*-intercept is* 7. *Alternatively, the* y*-intercept is the value when* $x = 0$. *We have* $f(0) = 7(1.38)^0 = 7(1) = 7$.

(c) Determine the growth or shrink rate for $f(x)$.

If $f(x) = A(1 + g)^x$, *where* $g > 0$, *then* $f(x)$ *is growing exponentially and the growth rate is* g*—written as a percentage. If* $f(x) = A(1 - g)^x$, *where* $g > 0$, *then* $f(x)$ *is shrinking exponentially and the shrink rate is* g. *We know from (a) that* $b = 1.38$. *We write* $b = 1.38 = 1 + 0.38$. *Therefore,* $f(x)$ *is growing exponentially with growth rate 38%.*

Problem 3: Let $y = 2^{2-x}$. Determine whether y is exponentially growing or decaying. Be sure to justify your answer. Sketch y below.



We write. . .

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

This is an exponential function Ab^x *with* $A = 4$ *and* $b = \frac{1}{2}$. *Because* $A = 4$, *the* y*-intercept is* 4. *Because* $b = \frac{1}{2}$ *and* $0 < b < 1$, *we know that the function is shrinking exponentially. We then sketch this function on the left.*