2. Exponential and Logarithmic Functions

Starter Quiz ·

AP Precalculus Name: _____ Score: _____

1. An **arithmetic sequence** has a constant…

   ☐ first term only

   ☐ difference between consecutive terms

   ☐ ratio between consecutive terms

   ☐ number of terms

2. Over equal input intervals, a nonconstant **linear function** changes by…

   ☐ a random amount

   ☐ adding a constant amount

   ☐ squaring the input

   ☐ multiplying by a constant factor

3. The **product rule** for exponents says $b^m \cdot b^n =$

   ☐ b^{m-n}

   ☐ b^{mn}

   ☐ $2b^{m+n}$

   ☐ b^{m+n}

4. In the unshifted model $y = ab^t$, the coefficient a is the output when…

   ☐ $t = 0$

   ☐ $y = 0$

   ☐ $t = 1$

   ☐ the data ends

5. In the **composition** $(f \circ g)(x) = f(g(x))$, which function acts **first**?

   ☐ they act at the same time

   ☐ neither acts

   ☐ g (the inner function)

   ☐ f (the outer function)

6. A function has an inverse function only if it is _____ (each output comes from exactly one input).

_____

7. The exponential has a horizontal asymptote; its inverse, the log, has a _____ asymptote instead.

   _____

8. For a valid base b, the unshifted function $f(x) = \log_b x$ has a _____ asymptote at $x = 0$.

   _____

9. Solve $2^x = 8$ by matching bases.

   _____

10. Every ordinary linear function, including nonconstant ones, stays straight when its positive output is plotted on a logarithmic vertical axis.

    ☐ True ☐ False

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Answers ·

AP Precalculus

1. **difference between consecutive terms**

   Each term is the previous one **plus** a fixed **common difference** – that steady addition makes it arithmetic.

2. **adding a constant amount**

   A line has a constant slope, so equal steps in x add the same amount to y – like an arithmetic sequence.

3. b^{m+n}

   Multiplying powers of the same base **adds** the exponents: $b^m \cdot b^n = b^{m+n}$.

4. $t = 0$

   At $t = 0$, $b^0 = 1$, so $y = a$ in this unshifted model. The first observed time need not be zero.

5. g **(the inner function)**

   Work inside-out: g acts on x first, then f acts on the result $g(x)$.

6. **one-to-one**

   If two inputs share an output, the reverse map is ambiguous – so only a **one-to-one** function is invertible.

7. **vertical**

   Reflecting across $y = x$ turns the horizontal asymptote $y = 0$ into the **vertical asymptote** $x = 0$.

8. **vertical**

   The function is unbounded near x=0 from the positive side. The limit is $-\infty$ for b>1 and $+\infty$ for 0<b<1, so x=0 is a vertical asymptote in both cases.

9. **3**

   $8 = 2^3$, so $2^x = 2^3$ gives $x = 3$ – equal bases mean equal exponents.

10. **False**

    False. Nonconstant ordinary linear functions generally curve on log-output axes. A positive constant remains horizontal; positive exponentials form straight patterns.