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Graded quiz on Tangent Lines to Functions, Exponents and Logarithms

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1. Convert $\frac{1}{49}$ to exponential form, using 7 as the factor. **1 / 1 point**

- ○ $\frac{7}{7^3}$
- ○ 49^{-1}
- ○ (7^2)
- ◉ 7^{-2}

Correct
The rule for a factor to a Negative exponent is to divide by the same factor to a positive exponent with the same absolute value.

2. A light-year (the distance light travels in a vacuum in one year) is $9,460$ trillion meters. Express in scientific notation. **1 / 1 point**

- ○ 9.46×10^{15} kilometers
- ○ 9460×10^{12} meters
- ◉ 9.46×10^{15} meters.
- ○ 0.946×10^{16}

Correct
$9,460$ is (9.4×10^3) meters and one trillion meters is 10^{12} meters. $(9.4 \times 10^3)(10^{12}) = 9.4 \times 10^{15}$. A kilometer is 1000 meters.

3. Simplify $(x^8)(y^3)(x^{-10})(y^{-2})$ **1 / 1 point**

- ○ $(x)(y^{-2})$
- ○ $(x^2)(y)$
- ◉ $(x^{-2})(y)$
- ○ $(x^{-80})(y^{-6})$

Correct
By the Division and Negative Powers Rule, this is $(x^{(8-10)})(y^{(3-2)})$

4. Simplify $[(x^4)(y^{-6})]^{-1}$ **1 / 1 point**

- ◉ $(x^{-4})(y^6)$
- ○ $\frac{(x^4)}{(y^{-6})}$
- ○ $(x^3)(y^{-7})$
- ○ $\frac{(x^{-}4)}{(y^6)}$

Correct
By the Power to a Power Rule, each of the exponents is multiplied by (-1)

5. Solve for x: **1 / 1 point**

$\log_2(39x) - \log_2(x-5) = 4$

- ◉ $\frac{-80}{23}$
- ○ $\frac{39}{23}$
- ○ $\frac{80}{38}$
- ○ $\frac{23}{80}$

Correct
$\log_2 \frac{39x}{(x-5)} = 4$ by the Quotient Rule.
Since both sides are equal, we can use them as exponents in an equation.

$$2^{\log_2 \frac{39x}{(x-5)}} = 2^4$$

$$\frac{39x}{(x-5)} = 16$$

$$39x = 16 \times (x-5)$$

$$39x = 16x - 80$$

$$23x = -80$$

$$x = \frac{-80}{23}$$

6. Simplify this expression: 1 / 1 point

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

- $x^{\frac{4}{3}}$
- x^{-1}
- ◉ $x^{\frac{-3}{4}}$
- $x^{\frac{1}{3}}$

✓ Correct
We use the Power to a Power Rule -- multiply exponents:

$$x^{\frac{1}{2} \times \frac{-3}{2}} = x^{\frac{-3}{4}}$$

7. Simplify $\log_2 8 - \log_2 4 - (\log_3 4.5 + \log_3 2)$ 1 / 1 point

- 0
- 2
- 1
- ◉ -1

✓ Correct
This is equivalent to:

$$\log_2(\tfrac{8}{4}) - \log_3(4.5 \times 2) = 1 - 2 = -1$$

8. If $\log_3 19 = 2.680$, what is $\log_9 19$? 1 / 1 point

- 0.8934
- 0.4347
- ◉ 1.304
- 5.216

✓ Correct
To convert from $\log_3$ to $\log_9$, divide by $\log_3 9$. Which is equal to 2, so the answer is 1.34

9. If $\log_{10} b = 1.8$ and $log_a b = 2.5752$, what is a? 1 / 1 point

- 4
- ◉ 5
- 6
- 3

✓ Correct
To solve for a in the formula;

$$\log_a b = \frac{\log_x b}{\log_x a}$$

$\log_a b = 2.5752$ and $\log_{10} b = 1.8$

Therefore, $\log_{10} a$ must equal to $\frac{1.8}{2.5752} = 0.69897$

Treating both sides of equation $\log_{10} a = 0.69897$ as exponents of 10 gives $a = 10^{0.69897} = 5$

10. An investment of $1,600$ is worth $7,400$ after 8.5 years. What is the continuously compounded rate of return of this investment? 1 / 1 point

- 19.01%
- 20.01
- 17.01%
- 18.02%

Correct

$$\frac{\ln \frac{7400}{1600}}{8.5} = 0.18017$$

11. A pearl grows in an oyster at a continuously compounded rate of $.24$ per year. If a 25-year old pearl weighs 1 gram, what did it weigh when it began to form? 1 / 1 point

- 0.002478
- 0.0002478
- 0.2478
- 0.02478

Correct

$$e^{(0.24\times 25)} = \frac{1}{x}$$

$$x = \frac{1}{\left(e^{0.24\times 25}\right)}$$

$$x = \frac{1}{403.4288}$$

$$x = 0.002478$$

12. $\log_2 z = 6.754$. What is $\log_{10}(z)$? 1 / 1 point

- 0.49185
- 1.3508
- 0.82956
- 2.03316

Correct

$$\frac{\log_2 z}{\log_2 10} =$$

$$(\log_{10} z) \times (\log_2 10) = 3.321928$$

Therefore, $\log_{10} z = \dfrac{6.754}{3.321928} = 2.03316$

13. Suppose that $g : \mathbb{R} \to \mathbb{R}$ is a function, and that $g(1) = 10$. Suppose that $g'(a)$ is negative for every single value of a.Which of the following could possibly be $g(1.5)$? 1 / 1 point

- $g(1.5) = 10.1$
- $g(1.5) = 9.7$
- $g(1.5) = 11$
- $g(1.5) = 103.4$

Correct

Since the slope of the tangent line to the graph of g is negative everywhere on the graph, we know that g is *decreasing* function! And therefore we must have $g(1.5) < g(1)$. That is the case here, so this value is at least possible.