

# Practice quiz onTangent Lines to Functions

PUNTOS TOTALES DE 2

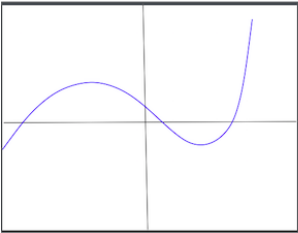
1. Suppose that  $f : \mathbb{R} \rightarrow \mathbb{R}$  is a function. Which of the following expressions corresponds to  $f'(2)$ , the slope of the tangent line to the graph of  $f(x)$  at  $x = 2$ ? 1 / 1 puntos

- ☐  $f'(2) = 2$
- ☐  $f'(2) = mx + b$
- ☒  $f'(2) = \lim_{h \rightarrow 0} \frac{f(2+h) - f(2)}{h}$
- ☐  $f'(2) = \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$

✓ Correcto

This expression can be obtained from the first screen of our video by plugging in 2 for  $a$ .

2. Suppose that  $h : \mathbb{R} \rightarrow \mathbb{R}$  is a function whose graph is shown as the blue curve in the figure. For how many values of  $a$  is  $h'(a) = 0$ ? 1 / 1 puntos



- ☐ 3
- ☐ Never
- ☐ Always
- ☒ 2

✓ Correcto

$h'(a)$  gives the slope of the tangent line to the graph of  $h$  at the point  $x = a$ .

When  $h'(a) = 0$ , this means that the tangent line is horizontal.

There are two places (one on each side of the  $y$ -axis) where this tangent line is horizontal, so this answer is correct.

## Practice quiz on Exponents and Logarithms

PUNTOS TOTALES DE 12

1. Re write the number  $784 = 2 \times 2 \times 2 \times 2 \times 7 \times 7$  using exponents.

1 / 1 puntos

- ☐  $(16^4)(49^2)$
- ☐  $(2 \times 7)^6$
- ☒  $(2^4)(7^2)$
- ☐  $(2^6)(7^6)$

✓ Correcto

For this type of problem, count the number of times each relevant factor appears in the product. That number is the exponent for that factor.

2. What is  $(x^2 - 5)^0$ ?

1 / 1 puntos

- ☐  $(x^2)$
- ☐  $-4$
- ☐  $(x^2) - 5$
- ☒ 1

✓ Correcto

Any real number (except zero) raised to the "zeroth" power = 1.

3. Simplify  $((x - 5)^2)^{-3}$

1 / 1 puntos

- ☐  $(x - 5)^{-1}$
- ☐  $(x - 5)$
- ☒  $(x - 5)^{-6}$
- ☐  $(x - 5)^{-5}$

✓ Correcto

By Rule 2, "Power to a Power," multiply the exponents and get:

$$(x - 5)^{(2 \times -3)} = (x - 5)^{-6}$$

By the definition of negative exponents, this is equal to  $\frac{1}{(x - 5)^6}$

4. Simplify  $(\frac{8^2}{8^7})^2$

1 / 1 puntos

- ☐  $8^{-5}$
- ☐  $8^{-4}$
- ☒  $8^{-10}$
- ☐  $8^{-1}$

✓ Correcto

We can first simplify what is inside the parenthesis to  $8^{-5}$  using the Division and Negative Powers Rule.

Then apply division and negative powers-- the result is the same.  $\frac{8^4}{8^{14}} = 8^{-10}$

5.  $\log 35 = \log 7 + \log x$

1 / 1 puntos

Solve for  $x$

- ☐ 7  
☐ 4  
☐ 28  
☒ 5

✓ **Correcto**  
 $\log(x) = \log 35 - \log 7$

$$\log(x) = \log\left(\frac{35}{7}\right)$$

By the Quotient Rule  $\log x = \log 5$

6.  $\log_2(x^2 + 5x + 7) = 0$

1 / 1 puntos

Solve for  $x$

- ☒  $x = -2$  or  $x = -3$   
☐  $x = 2$   
☐  $x = 3$   
☐  $x = 2$  or  $x = 3$

✓ **Correcto**  
 We use the property that  $b^{\log_b a} = a$

Use both sides as exponent for 2.

$$2^{\log_2 x^2 + 5x + 7} = 2^0$$

$$x^2 + 5x + 7 = 1$$

$$x^2 + 5x + 6 = 0$$

$$(x + 3)(x + 2) = 0$$

$$x = -3 \quad \text{OR}$$

$$x = -2$$

7. Simplify  $\log_2 72 - \log_2 9$

1 / 1 puntos

- ☐ 4  
☐  $\log_2 63$   
☐  $\log_2 4$   
☒ 3

✓ **Correcto**

By the quotient rule, this is  $\log_2 \frac{72}{9} = \log_2 2^3 = 3$

8. Simplify  $\log_3 9 - \log_3 3 + \log_3 5$

1 / 1 puntos

- ☐  $\log_3 8$   
☐ 8  
☒  $\log_3 15$   
☐ 15

✓ **Correcto**

By the Quotient and Product Rules, this is  $\log_3 \frac{9 \times 5}{3} = \log_3 15$

9. Simplify  $\log_2(3^8 \times 5^7)$

1 / 1 puntos

- ☒  $(8 \times \log_2 3) + (7 \times \log_2 5)$   
☐  $15 \times \log_2 56$   
☐  $56 \times \log_2 15$   
☐  $(5 \times \log_2 3) + (8 \times \log_2 5)$

✓ **Correcto**

We first apply the Product Rule to convert to the sum:  $\log_2(3^8) + \log_2(5^7)$ . Then apply the power and root rule.

10. If  $\log_{10} y = 100$ , what is  $\log_2 y = ?$

1 / 1 puntos

- ☐ 500
- ☒ 332.19
- ☐ 20
- ☐ 301.03

✓ Correcto

Use the change of base formula,  $\log_a b = \frac{\log_x b}{\log_x a}$

Where the "old" base is  $x$  and the "new" base is  $a$ .

$$\text{So } \frac{100}{\log_{10}(2)} = \frac{100}{0.30103} = 332.19$$

11. A tree is growing taller at a continuous rate. In the past 12 years it has grown from 3 meters to 15 meters. What is its rate of growth per year?

1 / 1 puntos

- ☐ 12.41%
- ☐ 10.41%
- ☐ 11.41%
- ☒ 13.41%

✓ Correcto

$$\frac{\ln \frac{15}{3}}{12} = 0.1341$$

12. Bacteria can reproduce exponentially if not constrained. Assume a colony grows at a continually compounded rate of 400% per day. How many days before a colony with initial mass of  $6.25 \times 10^{-10}$  grams weights 1000 Kilograms?

1 / 1 puntos

- ☐ 0.875 days
- ☒ 8.75 days
- ☐ 875 days
- ☐ 87.5 days

✓ Correcto

$$6.25 \times 10^{-10} \times e^{4t} = 10^6$$

$$4t = \ln \left( \frac{10^6}{(6.25 \times 10^{-10})} \right) = 35.00878$$

$$t = \ln \frac{10^6}{6.25 \times 10^{-10}} = 8.752195$$

# Graded quiz on Tangent Lines to Functions, Exponents and Logarithms

CALIFICACIÓN DEL ÚLTIMO ENVÍO

100%

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

1 / 1 puntos

☒  $7^{-2}$

☐  $49^{-1}$

☐  $\frac{7}{7^3}$

☐  $(7^2)$

✓ Correcto

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 puntos

☒  $9.46 \times 10^{15}$  meters.

☐  $0.946 \times 10^{16}$

☐  $9460 \times 10^{12}$  meters

☐  $9.46 \times 10^{15}$  kilometers

✓ Correcto

9, 460 is  $(9.4 \times 10^3)$  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 puntos

☐  $(x)(y^{-2})$

☐  $(x^2)(y)$

☒  $(x^{-2})(y)$

☐  $(x^{-80})(y^{-6})$

✓ Correcto

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

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

1 / 1 puntos

☐  $(x^3)(y^{-7})$

☐  $\frac{(x^{-4})}{(y^6)}$

☐  $\frac{(x^4)}{(y^{-6})}$

☒  $(x^{-4})(y^6)$

✓ Correcto

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

5. Solve for x:

1 / 1 puntos

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

☐  $\frac{23}{80}$

☐  $\frac{80}{38}$

☐  $\frac{39}{23}$

☒  $\frac{-80}{23}$

✓ Correcto

$$\log_2 \frac{39x}{(x - 5)} = 4 \text{ by the Quotient Rule.}$$

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 puntos

☐  $(x^{\frac{1}{2}})^{\frac{-3}{2}}$

☐  $x^{\frac{1}{3}}$

☒  $x^{\frac{-3}{4}}$

☐  $x^{\frac{4}{3}}$

☐  $x^{-1}$

✓ Correcto

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

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

7. Simplify  $\log_{10} 1000 + \log_{10} \frac{1}{10000}$

1 / 1 puntos

☐ 1

☐  $\frac{1}{10}$

☐  $\log_{10} -10$

☒ -1

✓ Correcto

By the Product Rule, this is:

$$\log_{10}\left(\frac{1000}{10000}\right) = \log_{10}\left(\frac{1}{10}\right) = -1$$

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

1 / 1 puntos

☐ 0.8934

☒ 1.304

☐ 0.4347

☐ 5.216

✓ Correcto

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 puntos

☐ 6

☒ 5

☐ 4

☐ 3

✓ Correcto

To solve for  $a$  in the formula;

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

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

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

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 puntos

- ☐ 20.01  
☒ 18.02%  
☐ 17.01%  
☐ 19.01%

✓ Correcto

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

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 puntos

- ☐ 0.02478  
☐ 0.0002478  
☒ 0.002478  
☐ 0.2478

✓ Correcto

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

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

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

$$x = 0.002478$$

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

1 / 1 puntos

- ☐ 0.49185  
☐ 1.3508  
☒ 2.03316  
☐ 0.82956

✓ Correcto

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

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

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

13. Suppose that  $g : \mathbb{R} \rightarrow \mathbb{R}$  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 puntos

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

✓ Correcto

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.