Name: Key Date: Block:

Algebra 2
Final Exam Review
Day 3 – Logarithms, Exponentials & Trigonometry

Logarithms

Rewrite the equation in exponential form.

1. $\log_8 1 = 0$ $8^0 = 1$

2. $\log_5 \left(\frac{1}{25}\right) = -2$ $5^{-2} = 1/25$

Simplify the expression.

3. $10^{\log x}$ $10^{\log_{10}(x)} = x$

4. $\log_5 125^{4x}$ $\log_5 (5^3)^{4x} = \log_5 5^{12x} = 12x$

5. $19^{\log_{19} 15x}$ $19^{\log_{19} 15x} = 15x$

Use a property of logarithms to evaluate the expression.

6.. $\log_3(3 \cdot 27)$ $\log_3 3 + \log_3 27 = 1 + 3 = 4$

7.. $\ln e^{-7}$ $= \log_e e^{-7} = -7$

8.. $\log_2 16^4$ $= \log_2 (2^4)^4 = \log_2 2^{16} = 16$

9.. $\log\left(\frac{1}{100}\right)^3$ $\log_{10}(10^{-2})^3 = \log_{10} 10^{-6} = -6$

Use $\log_9 5 \approx 0.732$ *and* $\log_9 11 \approx 1.091$ *to approximate the value of the expression.*

10. $\log_9 \frac{5}{11}$ $= \log_9 5 - \log_9 11 = 0.732 - 1.091 = -0.359$

11.. $\log_9 55$ $= \log_9 5 + \log_9 11 = 0.732 + 1.091 = 1.823$

12. $\log_9 25$ $= \log_9 5 + \log_9 5 = 0.732 + 0.732 = 1.464$

Expand the expression.

14. $\log_5 2x^6$ $\log_5 2 + 6\log_5 x$

15. $\log_7 \frac{y}{3x^2}$ $\log_7 y - \log_7 3 - 2\log_7 x$

Condense the expression.

16. $2\log_3 7 - 5\log_3 x$ $= \log_3 \left(\frac{49}{x^5}\right)$

17. $2\log_8 x + \log_8 5 - 3\log_8 y$ $= \log_8 \left(\frac{5x^2}{y^3}\right)$

Use the change-of-base formula to evaluate the expression.

18. $\log_6 15$ $\frac{\log 15}{\log 6} = 1.511$

19. $\log_4 8$ $= \frac{\log 8}{\log 4} = 1.5$

Solve the equation.

(20) $2^{4x} = (2^3)^{x-1}$ $2^{4x} = 2^{6x-5}$

20. $2^{4x} = 32^{x-1}$ $4x = 5x - 5$ $-x = -5$ $x = 5$

(21) $9^{2x} = 9^{2(3x-2)}$ $2x = 6x - 4$ $-4x = -4$ $x = 1$

21. $9^{2x} = 81^{3x-2}$

22. $4^x = 15$ $x = \log_4 15 = 1.953$

23. $5^{x+2} + 3 = 25$ (23) $5^{x+2} = 22$ $x + 2 = \log_5 22$ $x = \log_5(22) - 2$ $x = -0.0774$

24. $8 + 10^{5x+4} = 35$ (24) $10^{5x+4} = 27$ $5x + 4 = \log_{10} 27$ $5x = -2.5686$ $x = -0.5137$

25. $40e^{0.6x} = 240$ $e^{0.6x} = 6$ $0.6x = \ln(6)$ $x = \frac{\ln(6)}{0.6} \approx 2.986$

Solve the equation. Check for extraneous solutions.

26. $\log_4(x+3) = \log_4(8x+17)$

$x+3 = 8x+17$

$-14 = 7x$

$x = -2$

27. $\log_4(x+3) = 2$

$4^{\log_4(x+3)} = 4^2$

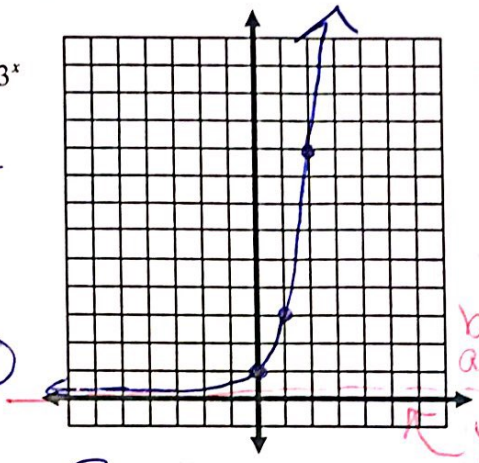
$x+3 = 16$ $\quad x = 13$

Exponentials

Graph the function and label at least three points on the graph, identify if its growth or decay. State the domain and range.

1. $y = 3^x$

x	y
0	1
1	3
2	9

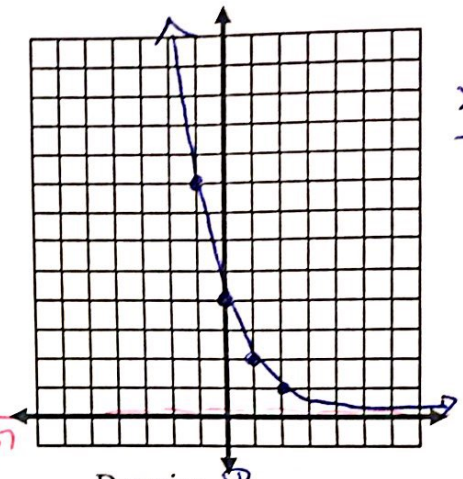


growth

Domain: $\mathbb{R}$

Range: $y > 0$

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



both asymptotes @ $y = 0$

x	y
0	4
1	2
2	1
-1	8

Domain: $\mathbb{R}$

Range: $y > 0$

2. What is the domain of $y = -2 \cdot \left(\frac{1}{3}\right)^x - 4$? What is the range? How was the function shifted?

Domain = $\mathbb{R}$

range: $y < -4$

function is reflected down and vertically shifted down 4 units

3. What is the domain of $y = 3(2^{x-1}) + 1$? What is the range? How was the function shifted?

Domain = $\mathbb{R}$

Range: $y > 1$

function is shifted to the right 1 unit and up 1 unit

4. What is the domain of $y = -e^{x-1}$? What is the range? How was the function shifted?

Domain: $\mathbb{R}$

range: $y < 0$

function is reflected down and shifted horizontally right 1 unit.

5. Jacob deposited $1800 in an account that pays 2.75% annual interest. Find the balance after 3 years if the interest is compounded:

a) Annually:

$$1800\left(1+\frac{.0275}{1}\right)^{3\times1} = \$1952.62$$

c) monthly:

$$1800\left(1+\frac{.0275}{12}\right)^{3\times12} = \$1954.61$$

b) Quarterly:

$$1800\left(1+\frac{.0275}{4}\right)^{3\times4} = \$1954.25$$

d) Daily:

$$1800\left(1+\frac{.0275}{365}\right)^{365\times3} = \$1954.79$$

Trigonometry

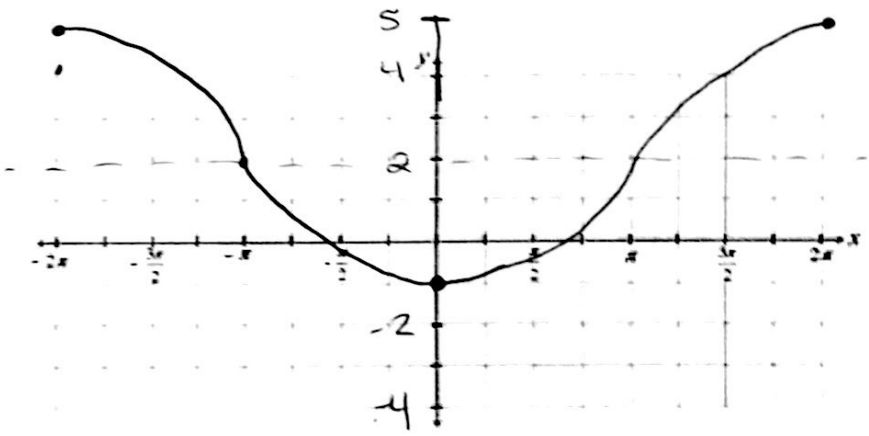
Given the equation $y = -3\cos\left(\frac{1}{2}x\right)+2$ **graph it and find:**

Amplitude: 3

Period: $\frac{2\pi}{(1/2)} = 4\pi$

Vertical shift: up 2

reflected

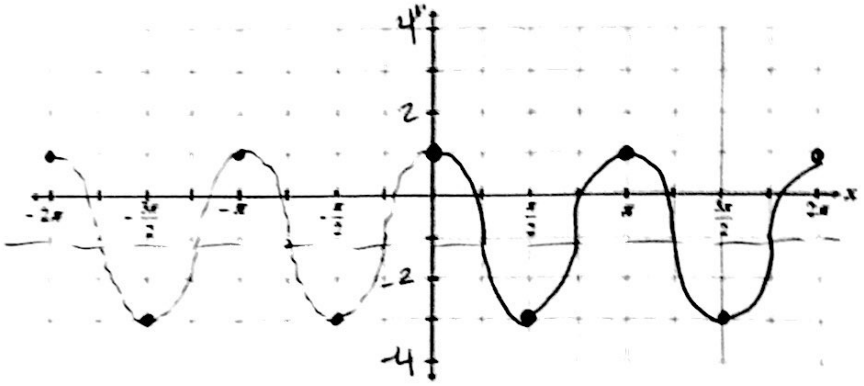


Given the equation $y = 2\cos(2x)-1$ **graph it and find:**

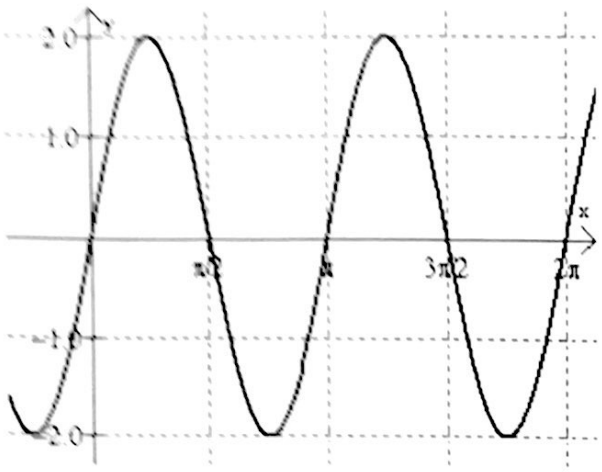
Amplitude: 2

Period: $\frac{2\pi}{2} = \pi$

Vertical shift: down 1



Determine the amplitude, period and write the equation for each function given



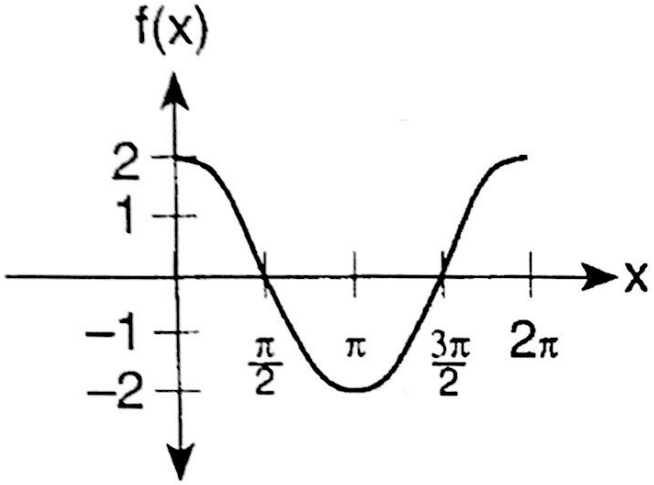
amplitude: 2

period: π

equation:

$y = 2\sin(2x)$

↑ amplitude ↑ # cycles completed by 2π



amplitude: 2

period: 2π

equation:

$y = 2\cos(x)$

Determine the amplitude and period for each function given

A) $y = 2\sin(x) + 2$

amplitude: 2

period: 2π

shift: up 2

B) $y = -3\cos(2x-1)$

amplitude: 3

period: $\frac{2\pi}{2} = \pi$

shift: right 1 unit

C) $y = \cos\frac{1}{2}x$

amplitude: 1

period: $\frac{2\pi}{(\frac{1}{2})} = 4\pi$

shift: none