Summer Math Packet for Calculus

The Spire School

For review of skills, visit

https://www.khanacademy.org/

https://www.virtualnerd.com/

https://www.youtube.com/

and simply put the topic on the left upper corner of the worksheet into the search engine.

9) $f(x)=\dfrac{x^2+4x+3}{x+3}$

10) $f(x)=\dfrac{x}{x^2-4x}$

11) $f(x)=\begin{cases}x+4, & x\le -2\\ -2x-11, & x>-2\end{cases}$

12) $f(x)=\dfrac{x+7}{x^2+3x}$

Find the intervals on which each function is continuous.

13) $f(x)=\begin{cases}x, & x\neq 4\\ 2, & x=4\end{cases}$

14) $f(x)=\begin{cases}-2, & x<3\\ -2x+6, & x\ge 3\end{cases}$

15) $f(x)=\dfrac{x-1}{x^2-4x+3}$

16) $f(x)=\dfrac{x^2}{2}+4x+10$

17) $f(x)=-x^2-4x+2$

18) $f(x)=-\dfrac{x-2}{x^2-3x+2}$

19) $f(x)=-\dfrac{x-1}{x^2-x}$

20) $f(x)=\dfrac{x}{x^2-6x+9}$

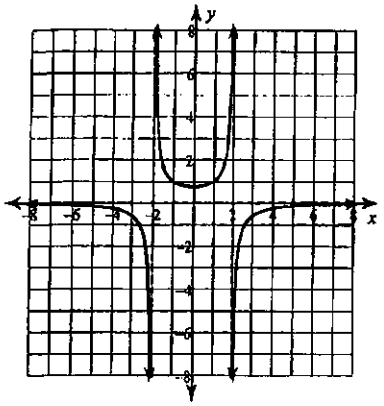
Critical thinking questions:

21) Write a function that has an infinite discontinuity at $x = 100$.

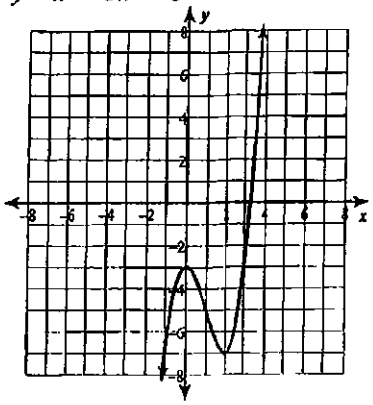
22) Write a function that is continuous over $(-\infty, 0)$, $(0, 1)$, and $(1, \infty)$ and discontinuous everywhere else.

Approximate the relative and absolute extrema of each function. Then approximate the intervals where each function is increasing and decreasing.

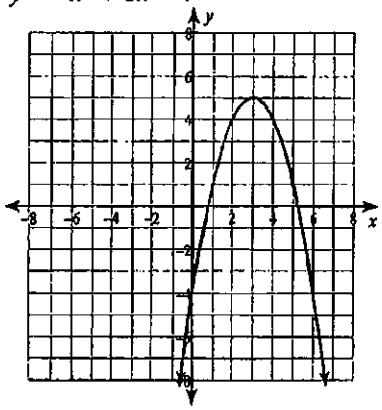
9) $y = -\dfrac{3}{x^2 - 4}$



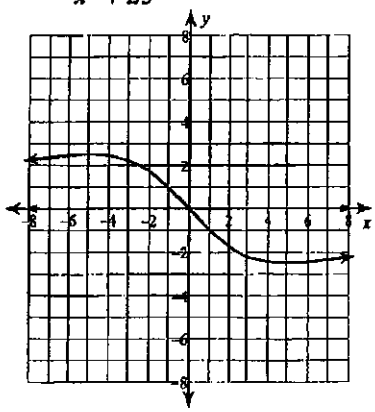
10) $y = x^3 - 3x^2 - 3$



11) $y = -x^2 + 6x - 4$



12) $y = -\dfrac{25x}{x^2 + 25}$



Critical thinking questions:

13) Write a function that has the following relative maximums: $(1, 1), (2, 2), (3, 3)$.

14) Is it possible for a continuous function to have only the following extrema?
Relative max: $(1, 1), (3, 3)$
Relative min: $(2, 2)$
Explain why or why not.

Kuta Software - Infinite Precalculus Name_____

The Remainder Theorem and Bounds

Date_____ Period____

Evaluate $f(x)$ at k.

1) $f(x) = x^3 - 4x^2 + 7x$
$k = -1$

2) $f(x) = x^3 - 16x$
$k = 1$

3) $f(x) = x^4 + 4x^3 + 5x^2 - 4x - 4$
$k = 1$

4) $f(x) = 5x^5 - 4x^4 - 5x^2 - 5$
$k = 1$

Find the remainder when $f(x)$ is divided by $x - k$.

5) $f(x) = 5x^6 + 5x^5 - 7x^4 + 7x^3 + 5x^2 - 4x - 1$
$k = -2$

6) $f(x) = 5x^4 - 6x^3 - x^2 + 7x - 2$
$k = 2$

7) $f(x) = x^4 + 12x^3 + 37x^2 + 42x + 16$
$k = -3$

8) $f(x) = 4x^6 - 5x^5 - 9x^4 + 2x^2 + 3x - 9$
$k = -1$

Kuta Software - Infinite Precalculus Name_____

Polynomials and Conjugate Roots

Date_____ Period____

A polynomial function with rational coefficients has the follow zeros. Find all additional zeros.

1) $-1,\ 1+3i$

2) $-\frac{1}{4},\ 1+\sqrt{6}$

3) -3 mult. 2, $2\sqrt{2}$

4) $1+\sqrt{3},\ -3+\sqrt{5}$

5) $1-i,\ \sqrt{7}$

6) $-3+2i,\ -2-2i,\ -2+2i$

Write a polynomial function of least degree with integral coefficients that has the given zeros.

7) $-\frac{1}{2},\ 1,\ \frac{3}{4}$

8) $-1,\ -i$

9) 2 mult. 3

10) $-3,\ 2\sqrt{2}$

11) $-3,\ \sqrt{3}$

12) $1+\sqrt{10}$ mult. 2, $1-\sqrt{10}$

13) $-i$ mult. 2

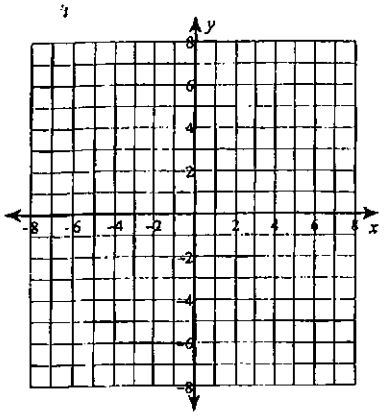
14) $\frac{4}{5},\ 2i$

Critical thinking questions:

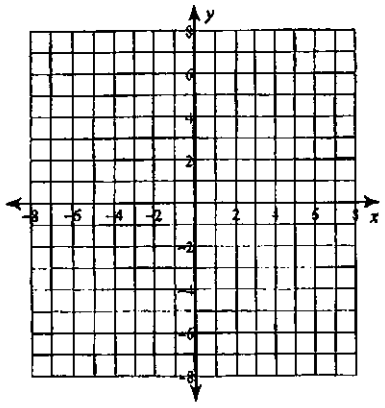
15) Explain why it makes sense that a third-degree polynomial must have at least one rational zero.

16) Write a polynomial function of degree ten that has two imaginary roots.

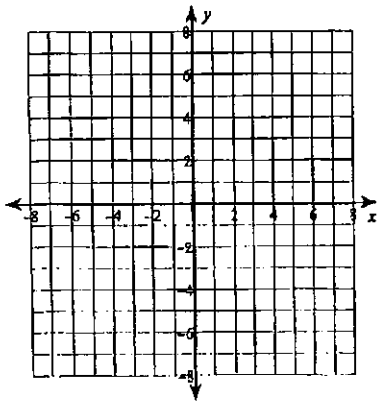
4) $f(x) = \dfrac{2x^2 - 12x + 16}{x^2 - x - 12}$



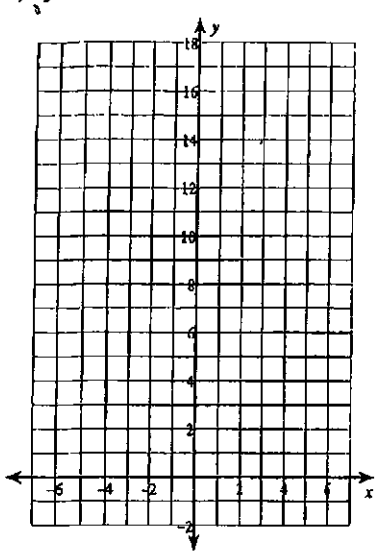
5) $f(x) = \dfrac{x^2 + 2x - 3}{-3x - 6}$



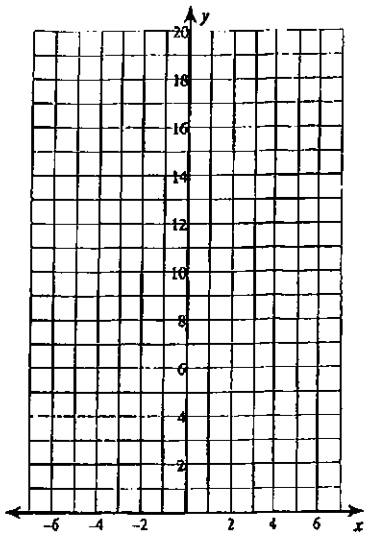
6) $f(x) = \dfrac{x^2 - x - 6}{x^2 - 2x - 8}$



5) $y = 4 \cdot 2^x - 2$

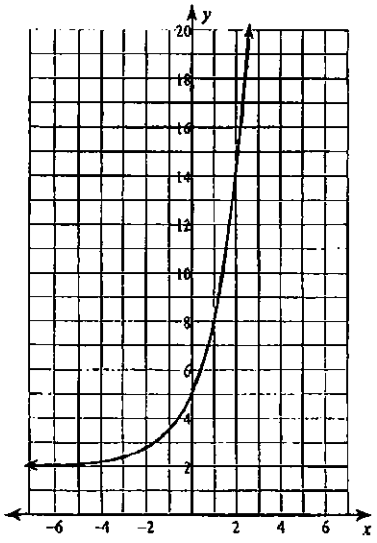


6) $y = 3 \cdot \left(\frac{1}{2}\right)^x + 2$

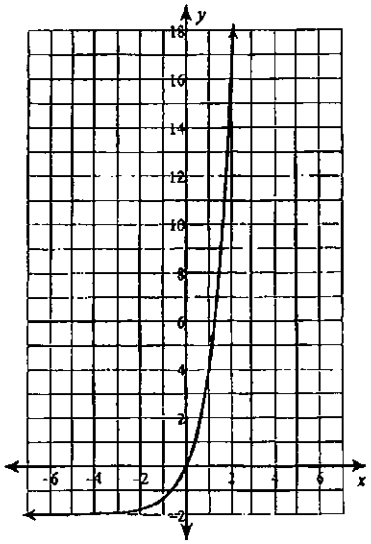


Write an equation for each graph.

7)



8)



Kuta Software - Infinite Precalculus

Name_____

Evaluating Logarithms

Date_____ Period____

Evaluate each expression.

1) $\log_7 \frac{1}{343}$

2) $\log_2 \frac{1}{8}$

3) $\log_4 16$

4) $\log_3 27$

5) $\log_7 49$

6) $\log_2 4$

7) $\log_7 \frac{1}{49}$

8) $\log_{64} \frac{1}{4}$

9) $\log_6 36$

10) $\log_6 \frac{1}{216}$

11) $\log_5 125$

12) $\log_4 \frac{1}{64}$

Condense each expression to a single logarithm.

13) $\log 6 - \log 5$

14) $\log 12 + \log 5$

15) $\log 6 + \log 7$

16) $\log 12 - \log 11$

17) $3\log x$

18) $6\log a$

19) $\log a - \log b$

20) $\dfrac{\log x}{2}$

21) $\log x + 5\log y$

22) $6\log u - 6\log v$

23) $4\log x + 4\log y$

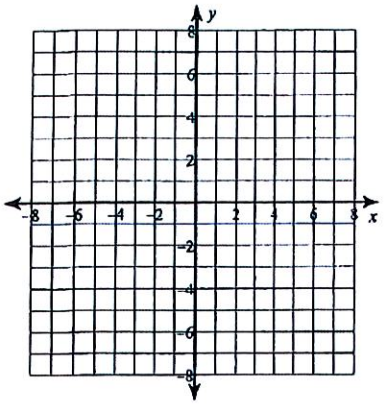
24) $\log u + \log v + \log w$

Critical thinking questions:

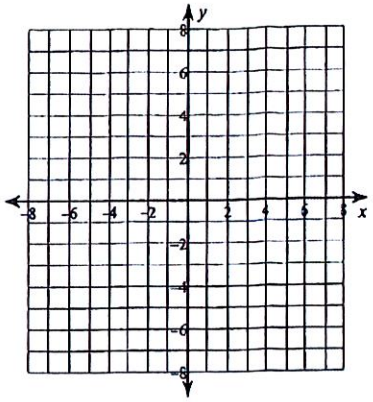
25) $2(\log 2x - \log y) - (\log 3 + 2\log 5)$

26) $\log x \cdot \log 2$

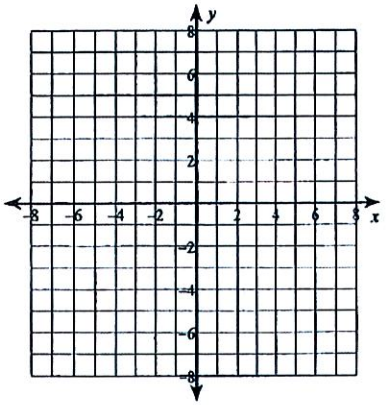
7) $y = \log_4(x-1) - 2$



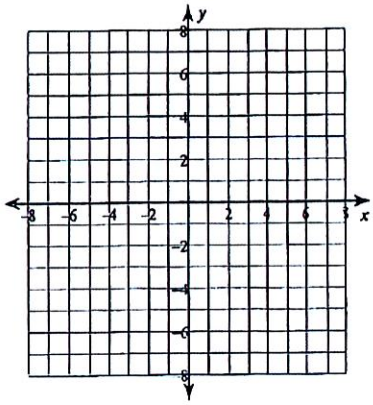
8) $y = \log_3(x+6) + 2$



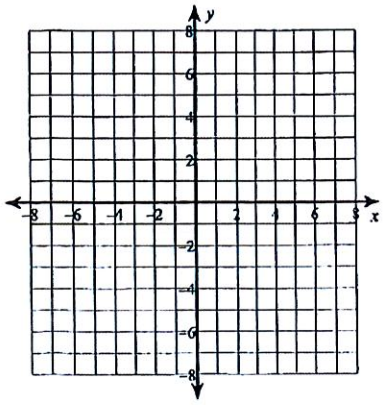
9) $y = \log_2(4x+16) - 2$



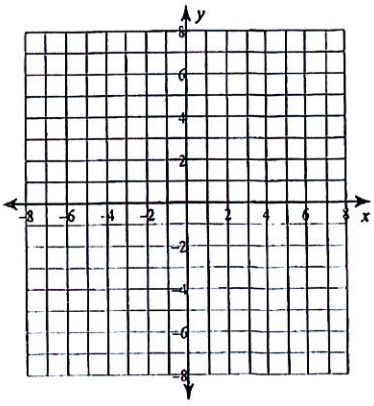
10) $y = \log(3x-4) - 4$



11) $y = \log_2(2x-1) - 4$

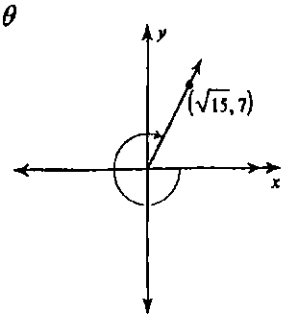


12) $y = \log_2(4x-8)$

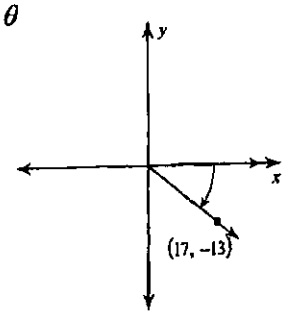


Use the given point on the terminal side of angle θ to find the value of the trigonometric function indicated.

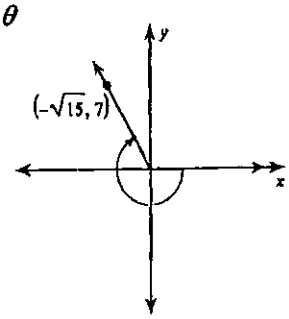
15) $\sin\theta$



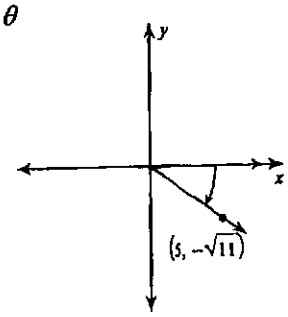
16) $\cot\theta$



17) $\sec\theta$



18) $\sin\theta$



Find the exact values of the five trigonometric ratios not given.

19) $\cot\theta = -\sqrt{7}$ and $\sin\theta > 0$

20) $\cos\theta = \frac{24}{25}$ and $\sin\theta < 0$

21) $\sin\theta = -\frac{2\sqrt{5}}{5}$ and $\cos\theta > 0$

22) $\tan\theta = -5$ and $\cos\theta > 0$

23) $\csc\theta = \frac{3\sqrt{7}}{7}$ and $\cos\theta < 0$

24) $\sec\theta = 2$ and $\sin\theta < 0$

Find all pairs of polar coordinates that describe the same point as the provided polar coordinates.

5) $(4, 90°)$

6) $\left(2, \frac{11\pi}{12}\right)$

Convert each pair of polar coordinates to rectangular coordinates.

7) $\left(2, \frac{3\pi}{2}\right)$

8) $\left(1, \frac{5\pi}{6}\right)$

Convert each pair of rectangular coordinates to polar coordinates where $r > 0$ and $0 \le \theta < 2\pi$.

9) $\left(\frac{3\sqrt{3}}{2}, \frac{3}{2}\right)$

10) $(-\sqrt{2}, \sqrt{2})$

Two points are specified using polar coordinates. Find the distance between the points.

11) $\left(2, \frac{\pi}{3}\right), \left(2, \frac{11\pi}{6}\right)$

12) $\left(4, \frac{7\pi}{12}\right), \left(2, \frac{\pi}{12}\right)$

Critical thinking question:

13) An air traffic controller's radar display uses polar coordinates. A passing plane is detected at 285° counter-clockwise from north at a distance of 3 miles from the radar. Thirty seconds later the plane is detected at 225° and 2 miles. Estimate the plane's speed in miles per hour.