AP Calculus AB Summer Packet

Directions: Welcome back! I hope you had a great summer! Answer the following questions without using a calculator. In part 1, you can use a QR code reader on your mobile device to scan the code to the right of the question if you need help, or click on the code if viewing digitally. Complete all graphs on the provided graph paper. Each graph should have actual plotted points that are labeled. In part 2, use these problems to test your knowledge from part 1. There is also a page of things to know from precalculus located at the end of this packet for reference.

Part 1:

Write an equation of the line with the given characteristics.

1. A line that goes through the point (1, -6) and has a slope of 3.

2. A vertical line through the point (0, -3).

3. A line that goes through the point (3, 1) and is parallel to the line represented by $2x - y = -2$.

4. A line that goes through the point (3, 1) and is perpendicular to the line represented by $2x - y = -2$.

5. A line with an x-intercept at (3, 0) and a y-intercept at (0, -5).

For each of the following equations, find the a) domain, b) range, and c) graph the function on a separate piece of paper or the graph paper provided at the end of this packet.

6. $y = -2 + \sqrt{1 - x}$

7. $y = 2e^{-x} - 3$

8. $y = \ln(x - 3) + 1$

9. $y = -|2x - 2| + 1$

10. $f(x) = \begin{cases} -x - 2, & -2 \le x \le -1 \\ x, & -1 < x \le 1 \\ -x + 2, & 1 < x \le 2 \end{cases}$

Find $f(g(x))$ and $g(f(x))$

11. $f(x) = 2 - x^2,\ g(x) = \sqrt{x + 2}$

Find f^{-1}

12. $f(x) = \frac{2x+1}{x+3}$

Find the six trigonometric values. Give exact answers.

13. $\theta = \cos^{-1}\left(\frac{3}{7}\right)$

Solve the equation over the interval $0 \leq x < 2\pi$.

14. $3\sin(x) - 4 = -2.5$

Find all of the asymptotes and holes for the function.

15. $y = \frac{2x^2-6x-8}{x^2+7x+6}$

Simplify the expression.

16. $\dfrac{\frac{2}{x} + \frac{3}{y}}{\frac{-5}{x} + \frac{7}{y}}$

Solve each equation. Leave your answer in log form.

17. $4 - 3^x = 0$

18. $5\log_4 x - \log_4 3 = 2$

19. Prove the identity.

$$\frac{\sin(x) - 1}{1 - \frac{1}{\sin(x)}} = \sin(x)$$

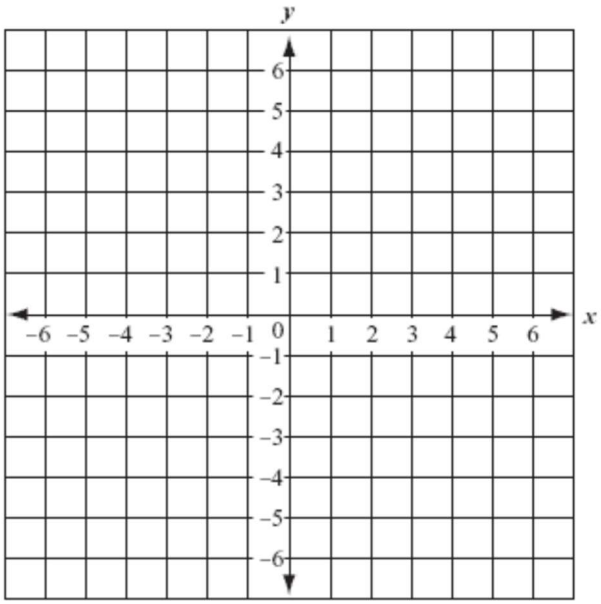
20. Solve the following equations:
    a. $x^2 - 2x - 35 = 0$

    b. $6x^2 - 11x - 7 = 3$

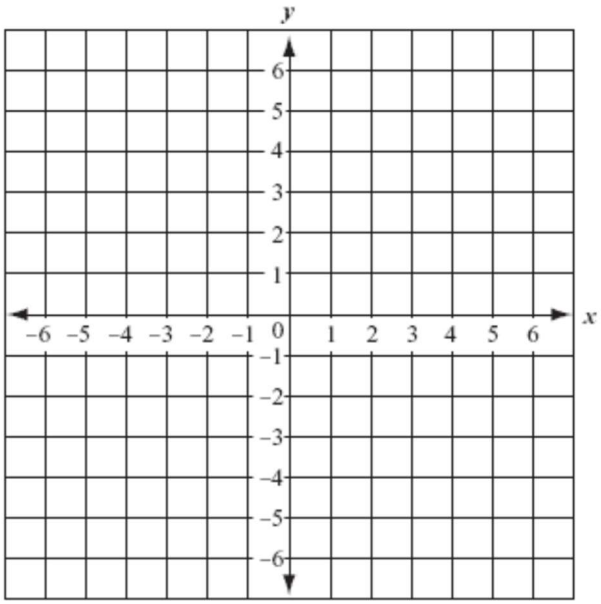
Part 2:

1. Sketch the graph of the function without a calculator and find the domain and range.

a. $y = -\ln(x-1)$



b. $y = \begin{cases} -x, & -4 \le x < 0 \\ 4, & 0 \le x < 1 \\ (x-1)^2 - 2, & 1 \le x < 3 \end{cases}$



2. Solve for x.

$$0 = x^3 - 9x$$

3. Change the expression $\log_7 14$ to a natural log expression.

4. Simplify the expression.

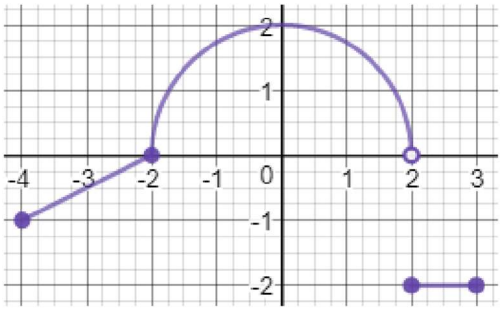
$$\frac{4 + \frac{1}{x}}{3 + \frac{2}{x^2}}$$

5. Find k in the equation $3y + kx = 4$ to:
   a. Make the line a horizontal line.
   b. Make the line parallel to $y = -4x + 5$.

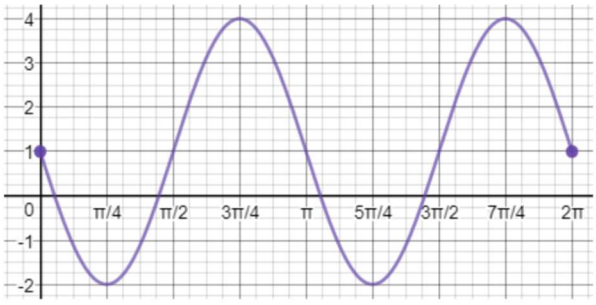
6. Find the equation of the line perpendicular to $y = -4x + 5$ that goes through $(4, 1)$.

7. Solve for x over the interval $0 \leq x < 2\pi$.
   a. $\sin(x) = \frac{\sqrt{3}}{2}$
   b. $6\cos(x) + 1 = 3\sqrt{2} + 1$
   c. $-5\tan(x) + 2 = -3$

8. Write an equation for $k(x)$ shown below.



9. Write an equation for $h(x)$ shown below.

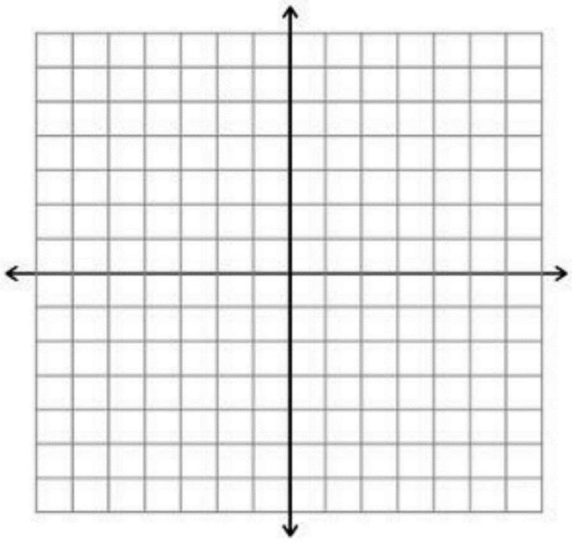


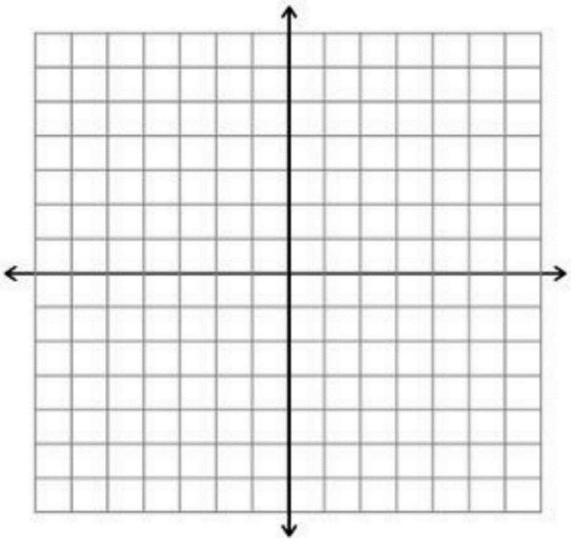
10. If $\ln(x) - \ln\left(\frac{1}{x}\right) = 2$, solve for x.

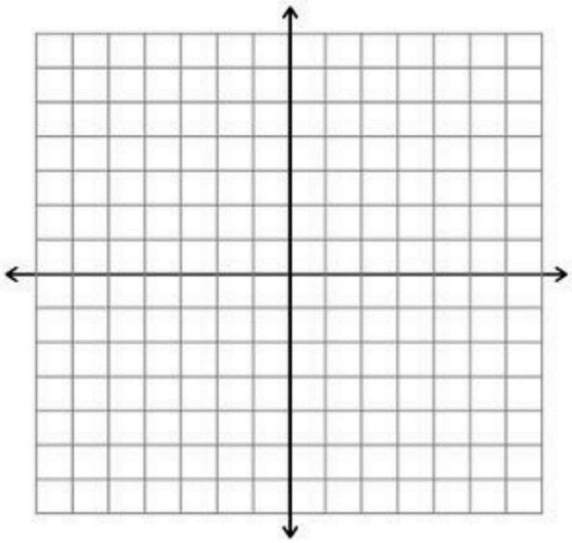
11. If $f(x) = \frac{4}{x-1}$ and $g(x) = 2x$, find all values of x such that $f\big(g(x)\big) = g\big(f(x)\big)$.

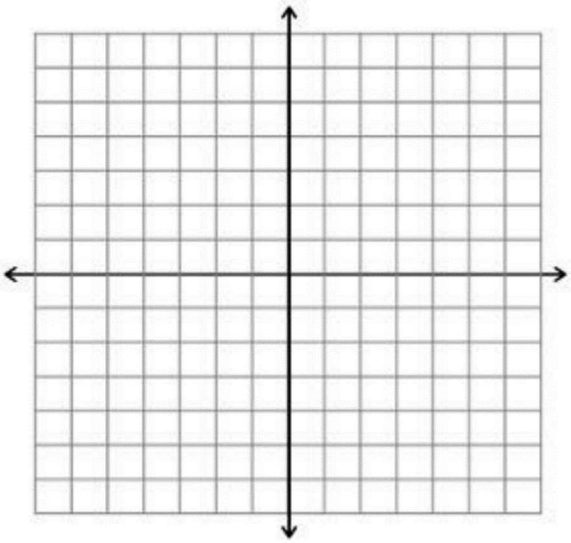
12. Prove the trigonometric identity.

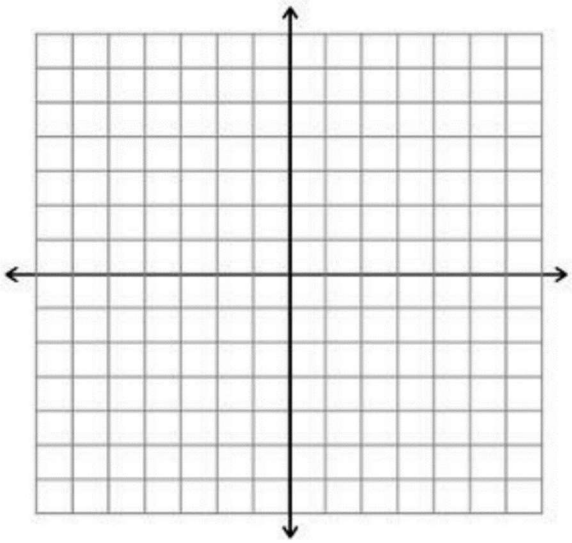
$$\frac{\cos^2(x)}{1-\cos^2(x)} = \cot^2(x)$$

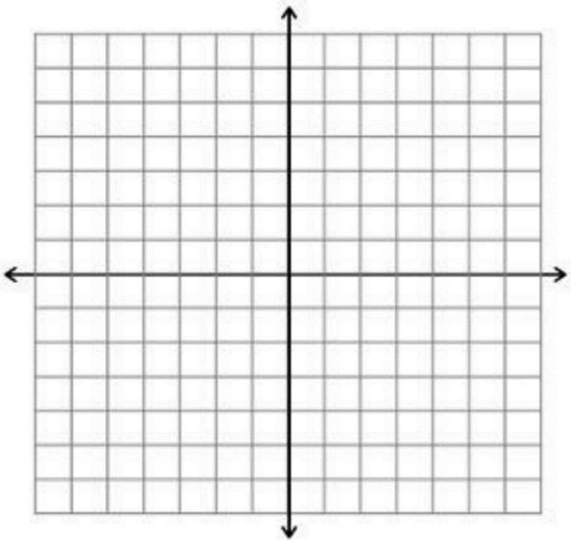






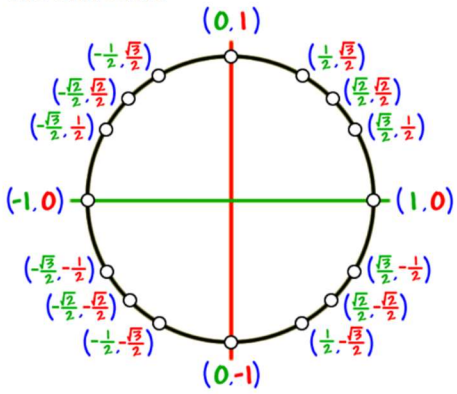


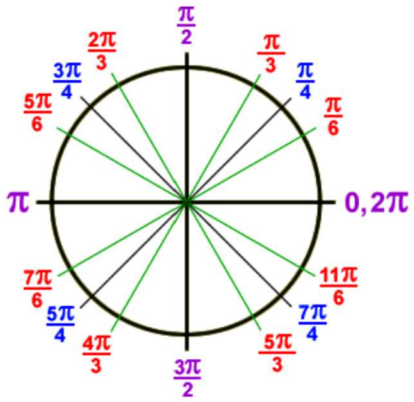




AP Calculus AB Stuff You Need to Know from Precalculus

The Unit Circle





Equation of a line with slope m through the point (x_1, y_1)

$$y - y_1 = m(x - x_1)$$

Radicals

$$\text{If } x^2 = a, \text{then } x = \pm a$$

Even and Odd Functions

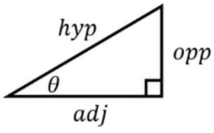
Even Function: $f(-x) = f(x)$
Odd Function: $f(-x) = -f(x)$

Trig Identities

$$\tan x = \frac{\sin x}{\cos x} \qquad \cot x = \frac{\cos x}{\sin x} \qquad \sin^2 x + \cos^2 x = 1$$

$$\csc x = \frac{1}{\sin x} \qquad \sec x = \frac{1}{\cos x} \qquad 1 - \sin^2 x = \cos^2 x$$

$$\sin x = \frac{1}{\csc x} \qquad \cos x = \frac{1}{\sec x} \qquad 1 - \cos^2 x = \sin^2 x$$



$$\sin\theta = \frac{opp}{hyp} \qquad \cos\theta = \frac{adj}{hyp} \qquad \tan\theta = \frac{opp}{adj}$$

$$\sin(2x) = 2\sin x \cos x \qquad \cos(2x) = \cos^2 x - \sin^2 x = 2\cos^2 x - 1 = 1 - 2\sin^2 x$$

Exponents and Logarithms

$$a^0 = 1, a \neq 0 \qquad a^1 = a \qquad \ln 1 = 0 \qquad \ln\left(\frac{m}{n}\right) = \ln m - \ln n$$

$$a^m \cdot a^n = a^{m+n} \qquad \frac{a^m}{a^n} = a^{m-n} \qquad \ln e = 1 \qquad \ln(m^n) = n \ln m$$

$$(a^m)^n = a^{mn} \qquad a^{-m} = \frac{1}{a^m} \qquad \ln(mn) = \ln m + \ln n \qquad e^{\ln x} = x = \ln e^x$$

$$a^{\frac{m}{n}} = \sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m \qquad log_b x = y \Leftrightarrow b^y = x \qquad log_b x = \frac{\ln x}{\ln b}$$

Inverse Trig

$$\theta = \sin^{-1} x \Leftrightarrow x = \sin\theta \qquad \sin^{-1} x = \arcsin x$$

$$\theta = \cos^{-1} x \Leftrightarrow x = \cos\theta \qquad \cos^{-1} x = \arccos x$$

$$\theta = \tan^{-1} x \Leftrightarrow x = \tan\theta \qquad \tan^{-1} x = \arctan x$$

Function	Domain	Range
$\theta = \sin^{-1} x$	$-1 \leq x \leq 1$	$-\frac{\pi}{2} \leq \theta \leq \frac{\pi}{2}$
$\theta = \cos^{-1} x$	$-1 \leq x \leq 1$	$0 \leq \theta \leq \pi$
$\theta = \tan^{-1} x$	$-\infty \leq x \leq \infty$	$-\frac{\pi}{2} < \theta < \frac{\pi}{2}$