AP Calculus Precalculus Review #1 **Name:** Key

Welcome back! I hope you had a great summer! Answer the following questions without using a calculator. You can use your parent graph sheet to help when sketching graphs. 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.

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.

$y - y_1 = m(x - x_1)$ Point-slope form

$y + 6 = 3(x - 1)$

2. A vertical line through the point (0, -3). * Horizontal line would be $y = -3$

$x = 0$

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

↳ same slope

$\frac{-y}{-1} = \frac{-2x}{-1} - \frac{2}{-1}$

$y = 2x + 2$

↳ slope

$y - 1 = 2(x - 3)$

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

perpendicular ($\perp$) is opposite reciprocal

$2 \perp -\frac{1}{2}$ $\quad y - 1 = -\frac{1}{2}(x - 3)$

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

$\frac{-5 - 0}{0 - 3} = \frac{-5}{-3} = \frac{5}{3}$ $\quad m = \frac{y_2 - y_1}{x_2 - x_1}$

$y - 0 = \frac{5}{3}(x - 3)$ or $y + 5 = \frac{5}{3}(x - 0)$

For each of the following equations, find the a) domain, b) range, and c) graph the function.

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

$1 - x \geq 0$

$-x \geq -1$

$x \leq 1$

$y = -2 + \sqrt{1-1}$

$y = -2$

Domain $(-\infty, 1]$ Range $[-2, \infty)$

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

↳ Horizontal asymptote

Domain $(-\infty, \infty)$ Range $(-3, \infty)$

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

↓ V.A. (vertical asymptote)

Domain $(3, \infty)$ Range $(-\infty, \infty)$

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

upside down

$2x - 2 = 0$

$2x = 2$

$x = 1$ → vertex

$y = -|2(1)-2|+1$

$= 0 + 1$

$= 1$ V: $(1, 1)$

Domain $(-\infty, \infty)$ Range $(-\infty, 1]$ ↳ y of vertex

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

Domain $[-2, 2]$ Range $[-1, 1]$

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

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

$f(g(x)) = 2 - (g(x))^2$

$= 2 - (\sqrt{x+2})^2$

$= 2 - (x+2)$

$= 2 - x - 2 = \boxed{-x}$

$g(f(x)) = \sqrt{f(x) + 2}$

$= \sqrt{2 - x^2 + 2}$

$= \boxed{\sqrt{4 - x^2}}$

Find f^{-1}

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

$x = \frac{2y+1}{y+3}$

$x(y+3) = 2y+1$

$xy + 3x = 2y + 1$

$xy - 2y = 1 - 3x$

$y(x-2) = 1 - 3x$

$y = \frac{1-3x}{x-2}$

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

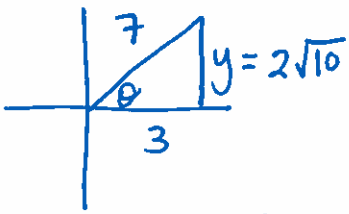
Find the six trigonometric values. Give exact answers.

$7^2 = 3^2 + y^2$

$49 - 9 = y^2 = 40 \rightarrow \sqrt{40} = \sqrt{4}\cdot\sqrt{10} = 2\sqrt{10}$

13. $\theta = Cos^{-1}\left(\frac{3}{7}\right)$ (a = 7, h = 3)

"+" so 1st quadrant



$\sin\theta = \frac{2\sqrt{10}}{7}$ $\tan\theta = \frac{2\sqrt{10}}{3}$ $\csc\theta = \frac{7}{2\sqrt{10}}\cdot\frac{\sqrt{10}}{\sqrt{10}} = \frac{7\sqrt{10}}{20}$ $\sec\theta = \frac{7}{3}$ $\cot\theta = \frac{3}{2\sqrt{10}}\cdot\frac{\sqrt{10}}{\sqrt{10}} = \frac{3\sqrt{10}}{20}$

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

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

$3\sin x = 1.5$

$\sin x = \frac{1.5}{3}$

$\sin x = \frac{1}{2}$

$x = \sin^{-1}\left(\frac{1}{2}\right)$

sin is $\frac{1}{2}$ @ $\frac{\pi}{6}$ and $\frac{5\pi}{6}$

$x = \frac{\pi}{6}, \frac{5\pi}{6}$

Find all of the asymptotes and holes for the function

15. $y = \frac{2x^2 - 6x - 8}{x^2 + 7x + 6} \rightarrow \frac{2(x^2 - 3x - 4)}{(x+6)(x+1)} \rightarrow \frac{2(x-4)(x+1)}{(x+6)(x+1)}$ hole

(equal)

H.A = $\frac{2}{1} = 2$

V.A $x = -6$

Horizontal $y = 2$

Hole $x = -1$

Simplify the expression.

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

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

$\rightarrow \frac{2y+3x}{xy} \cdot \frac{xy}{7x-5y}$

$\rightarrow \frac{2y + 3x}{7x - 5y}$

Solve each equation. Leave your answer in log form.

17. $4 - 3^x = 0$

$-3^x = -4$

$3^x = 4$

$x \ln 3 = \ln 4$

$x = \frac{\ln 4}{\ln 3}$ or $\log_3 4$

same thing

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

exponent w/logs ÷ w/ logs

$\log_4 x^5 - \log_4 3 = 2$

$\log_4 \left(\frac{x^5}{3}\right) = 2 \rightarrow 4^2 = \frac{x^5}{3}$

$16 = \frac{x^5}{3} \rightarrow 48 = x^5$ $x = \sqrt[5]{48}$

19. Prove the identity:

$\sin\theta(\cot\theta + \tan\theta) = \sec\theta$

$\sin\theta\cot\theta + \sin\theta\tan\theta$

$\sin\theta \cdot \frac{\cos\theta}{\sin\theta} + \frac{\sin\theta \cdot \sin\theta}{\cos\theta}$

$\frac{\cos\theta}{\cos\theta} \cdot \cos\theta + \frac{\sin^2\theta}{\cos\theta}$

$\frac{\cos^2\theta + \sin^2\theta}{\cos\theta}$

$\frac{1}{\cos\theta} = \sec\theta = \sec\theta$ RHS ✓

20. Solve the following equations:

a) $x^2 - 2x - 35 = 0$

$(x-7)(x+5) = 0$

$x - 7 = 0 \quad x + 5 = 0$

$x = 7$ $x = -5$

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

$6x^2 - 11x - 10 = 0$

$6 \cdot -10 = -60$

$-15, +4$

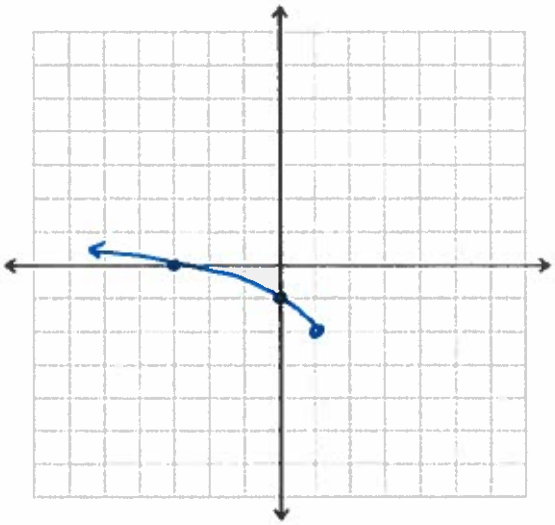
$6x^2 - 15x + 4x - 10 = 0$

$3x(2x-5) + 2(2x-5) = 0$

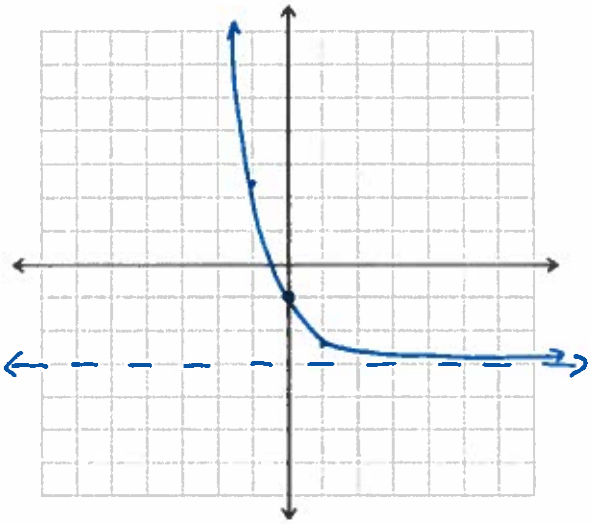
$(2x-5)(3x+2) = 0$

$x = \frac{5}{2}$ $x = -\frac{2}{3}$

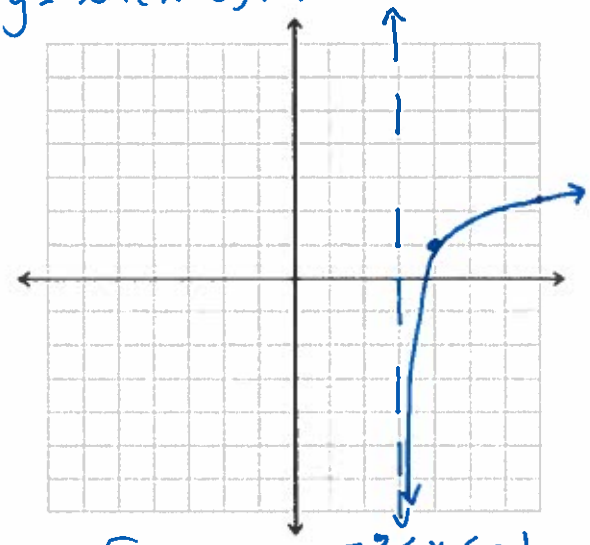
6.) $y = -2 + \sqrt{1-x}$



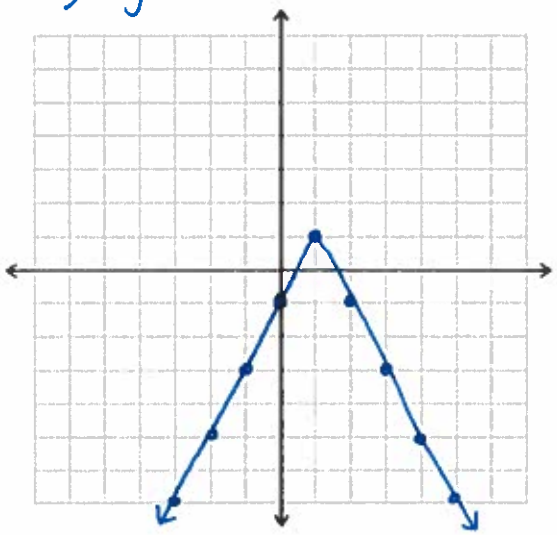
7.) $y = 2e^{-x} - 3$



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



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



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