



Monmouth Regional High School



Summer Skills Packet

For students entering AP PreCalculus

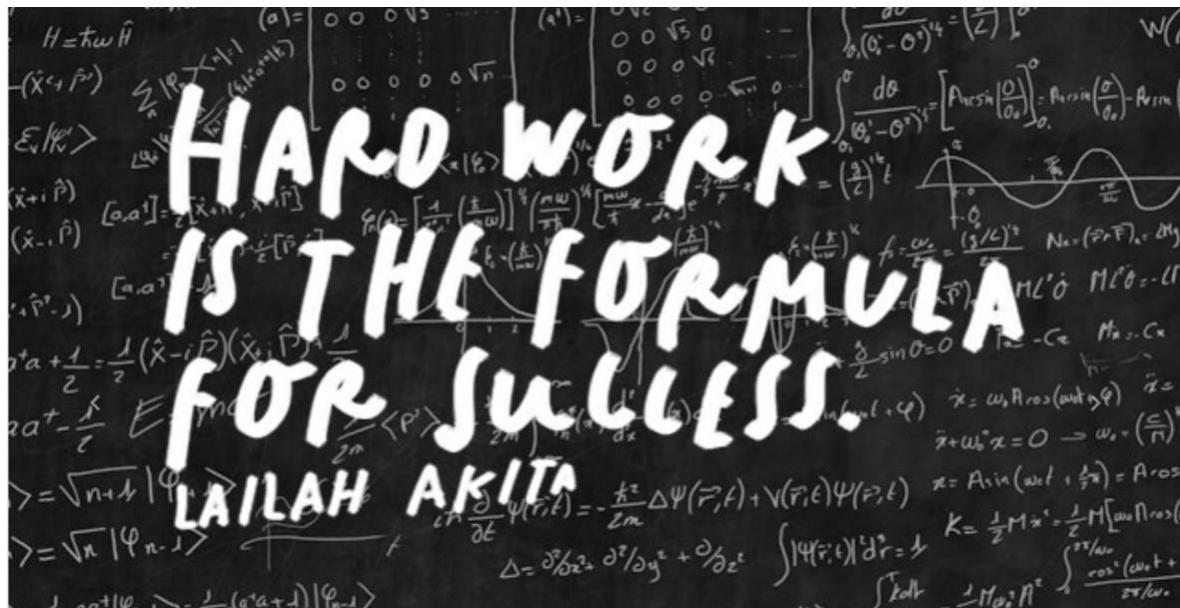
This packet is **NOT** **OPTIONAL**

All topics will be **reviewed** the first day.

A test, on all concepts, will be given the **second day** of class.

For students that need additional support, check out Khan Academy.
Answers are included in the back of the packet.

Have a great summer and we look forward to seeing you in September!!



Show all WORK. Exact answers means NO decimals!

1. Find the zeros of $f(x) = x^4 - 3x^3$

2. Solve for x . (give EXACT answer)
 $e^{2x} = 9$

3-4 Find the asymptotes and holes.

3. $y = \frac{5x}{x-1}$

4. $y = \frac{x-1}{x^2-1}$

5. Given $f(x) = 2x - 3$, find $f(x + h)$

6. Simplify the expression $2 \ln e^{5x}$

7. How many real zeros does $f(x) = (2x - 1)(x - 5)(x^2 + 1)$ have?

8. $f(x)$ is odd and contains the point $(6, 5)$. What other point does $f(x)$ have to have?

A. $(-6, 5)$ B. $(-6, -5)$ C. $(-5, -6)$

D. $(6, -5)$ E. $(5, 6)$

9-10 Given the line $4x + 3y = 8$, write the equation passing through the point $(2, -1)$ that is...

9. parallel to the given line

10. perpendicular to the given line

11. $f(x) = x^2 - x + 1$, then $f(x + 1) =$

12. Find the inverse of $y = 2x^3 + 1$

13-14 Write the equation given the transformations.13. Shift $y = x^2$ up 2 units and right 4 units.14. Shift $y = \sqrt[3]{x}$ left 1 unit reflected over the x-axis.15. What is the slope of $2x + 3y = 6$?16. The point $(2, 1)$ is on a graph, then what point is on the graph of the inverse.17. Solve for x in terms of s. $s^{2x} - e = 2$ 18. Solve $x^3 + 2x^2 + 9x + 18 = 0$

19. Describe the end behavior.

$$f(x) = x^4 + 3x^3 - 6x$$

20. Describe the end behavior.

$$f(x) = -3x^3 + x^2$$

21. Find the domain.

$$f(x) = \frac{x-3}{\sqrt{x-2}}$$

22. The graph of an even function is symmetrical to...

- A. x-axis
- B. y-axis
- C. origin
- D. no symmetry

23. Find the range of $y = 2|x - 2| - 2$.24. Find the domain of $y = e^{-2x} + 1$.**25-28 Factor completely.**

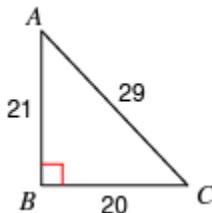
25. $3x^4 - x^3 - 12x^2 + 4x$

26. $32x^4 - 108x$

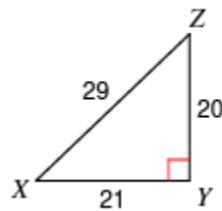
27. $16x^4 - 81y^4$

28. $6x^2 + 47xy - 8y^2$

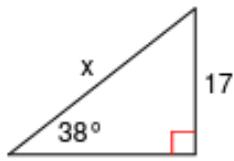
29. Find the exact value of the trig ratio.
 $\cos C$



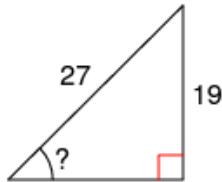
30. Find the exact value of the trig ratio.
 $\tan Z$



31. Find the missing side length to the nearest hundredth.



32. Find the missing angle measure to the nearest degree.



33. Find the exact value of the expression without using a calculator: $\sin(30^\circ)$

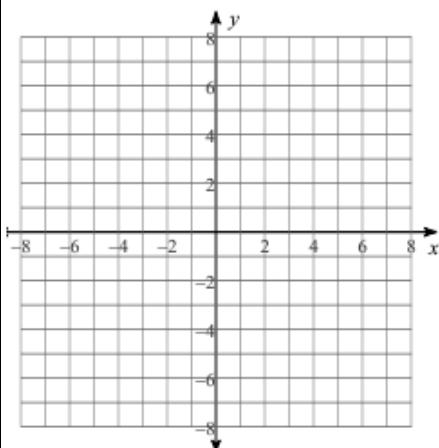
34. Find the exact value of the expression without using a calculator: $\tan(120^\circ)$

35. Find the exact value of the expression without using a calculator: $\cos\left(\frac{4\pi}{3}\right)$

36. Find the exact value of the expression without using a calculator: $\sec\left(\frac{7\pi}{4}\right)$

37. Sketch the graph below.

$$g(x) = \begin{cases} -x, & x \leq -3 \\ -5, & -3 < x < 2 \\ -x + 2, & x \geq 2 \end{cases}$$



38. Solve the system of equations below.

$$\begin{aligned} -x - 5y - 5z &= 2 \\ 4x - 5y + 4z &= 19 \\ x + 5y - z &= -20 \end{aligned}$$

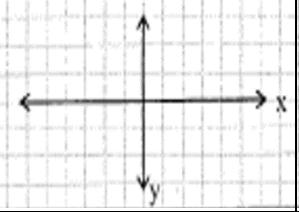
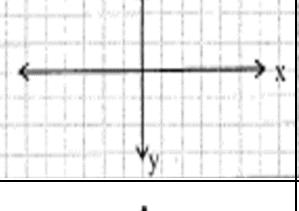
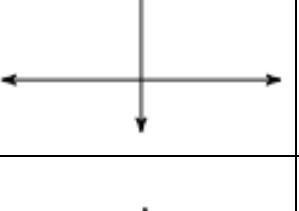
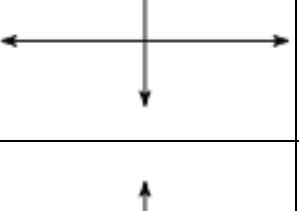
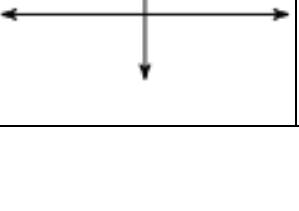
Circle the statements that are NOT true.

$(xy)^n = x^n y^n$	$x \log a^w = \log a^{xw}$	$\frac{(x+2)}{x+5} = \frac{2}{5}$
$(2x)^2 = 2x^2$	$\log x \cdot \log w = \log(x + w)$	$3x + 3x = 6x^2$
$\frac{ab + ac}{a} = b + c$	$-2^4 = 16$	$1^{-1} = -1$
$\frac{a}{ab + ac} = \frac{1}{b + c}$	$-x^2 = x^2$	$(a + b)^2 = a^2 + b^2$
$\frac{4x + 3y}{w} = \frac{4x}{w} + \frac{3y}{w}$	$-\frac{a}{b} = \frac{ac}{b}$	$a^2 + b^2 = (a + b)(a - b)$
$\frac{w}{4x + 3y} = \frac{w}{4x} + \frac{w}{3y}$	$\frac{\sqrt{xy}}{x} = \sqrt{y}$	$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
$\frac{ab + ac + d}{aw} = \frac{b + c + d}{w}$	$\frac{a}{b} = \frac{ab}{c}$	$\frac{\log a}{\log b} = \log a - \log b$
$\sqrt{x^2 + y^2} = x + y$	$\log ab = \log a + \log b$	$\frac{1}{\sqrt{x} + \sqrt{y}} = \sqrt{x} + \sqrt{y}$
$\frac{\ln a}{\ln b} = \frac{a}{b}$	$\frac{1}{0} = 0$	$2(x)^n = (2x)^n$
$\frac{a}{b} + \frac{c}{d} = \frac{a+c}{b+d}$	$\frac{a}{ax} = x$	$\frac{a}{b} \cdot \frac{c}{d} = \frac{ad}{bc}$
$\frac{a}{x^{-n}} = x^n$	$\frac{a}{b} \cdot \frac{c}{d} = \frac{bc}{ad}$	$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$

Special Functions

- Your graphs have to be specific as possible. Label axes, intercepts, asymptotes, etc.
- Use correct notation for the domain and range.
- It needs to be neat and clean.
- Please use a ruler.

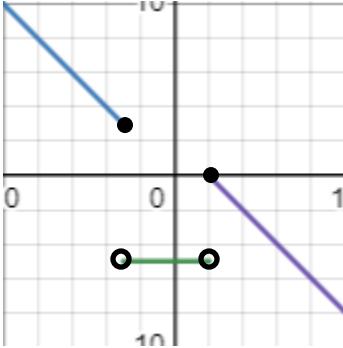
Function	Graph	Domain (Set)	Domain (Int.)	Range (Set)	Range (Int.)
$f(x) = [x]$					
$f(x) = c$					
$f(x) = x$					
$f(x) = x $					
$f(x) = x^2$					
$f(x) = \sqrt{x}$					

Function	Graph	Domain (Set)	Domain (Int.)	Range (Set)	Range (Int.)
$f(x) = \frac{1}{x}$					
$f(x) = x^3$					
$f(x) = \sqrt[3]{x}$					
$y = b^x$ when $b > 1$ Exponential Growth					
$y = b^x$ when $0 < b < 1$ Exponential Decay					
$f(x) = \log_b x$ when $b > 1$ Logarithmic Growth					
$f(x) = \log_b x$ when $0 < b < 1$ Logarithmic Decay					

Answers

Please check your answers before the first day of school. Circle any incorrect responses. We will review the first day of class.

1. $x = [0, 3]$	2. $x = \frac{\ln 9}{2}$
3. vertical asymptote $x = 1$ horizontal asymptote $y = 5$ no holes	4. vertical asymptote $x = -1$; horizontal asymptote $y = 0$ holes $x = 1$
5. $f(x + h) = 2x + 2h - 3$	6. $10x$
7. 2 zeros at $x = [\frac{1}{2}, 5]$	8. B. $(-6, -5)$
9. $y = -\frac{4}{3}x + \frac{5}{3}$	10. $y = \frac{3}{4}x - \frac{5}{2}$
11. $f(x + 1) = x^2 + x + 1$	12. $y = \sqrt[3]{\frac{x-1}{2}}$
13. $y = (x^2 - 4) + 2$	14. $y = -(\sqrt[3]{x} + 1)$
15. $m = -\frac{2}{3}$	16. $(1, 2)$
17. $x = \frac{\ln(2+e)}{2 \ln s}$ or $x = \frac{\log_s(2+e)}{2}$	18. $x = [-2, 3i]$
19. $x \rightarrow -\infty, f(x) \rightarrow +\infty$ $x \rightarrow +\infty, f(x) \rightarrow +\infty$	20. $x \rightarrow -\infty, f(x) \rightarrow +\infty$ $x \rightarrow +\infty, f(x) \rightarrow -\infty$
21. $(2, +\infty)$	22. B. y-axis
23. $[-2, +\infty)$	24. $(-\infty, \infty)$
25. $x(x + 2)(x - 2)(3x - 1)$	26. $4x(2x - 3)(4x^2 + 6x + 9)$
27. $(4x^2 + 9y^2)(2x^2 + 3y^2)(2x^2 - 3y^2)$	28. $(6x - y)(x + 8y)$
29. $\cos C = \frac{20}{29}$	30. $\tan Z = \frac{21}{20}$
31. $x \cong 27.61$	32. $\theta \cong 45^\circ$

33. $\sin 30^\circ = \frac{1}{2}$	34. $\tan 120^\circ = -\sqrt{3}$
35. $\cos \frac{4\pi}{3} = -\frac{1}{2}$	36. $\sec \frac{7\pi}{4} = \sqrt{2}$
37. 	38. $x = -2, y = -3, z = 3$

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$\frac{w}{4x + 3y} = \frac{w}{4x} + \frac{w}{3y}$	$\frac{\sqrt{xy}}{x} = \sqrt{y}$	$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
$\frac{ab + ac + d}{aw} = \frac{b + c + d}{w}$	$\frac{a}{b} = \frac{ab}{c}$	$\frac{\log a}{\log b} = \log a - \log b$
$\sqrt{x^2 + y^2} = x + y$	$\log ab = \log a + \log b$	$\frac{1}{\sqrt{x} + \sqrt{y}} = \sqrt{x} + \sqrt{y}$
$\frac{\ln a}{\ln b} = \frac{a}{b}$	$\frac{1}{0} = 0$	$2(x)^n = (2x)^n$
$\frac{a}{b} + \frac{c}{d} = \frac{a+c}{b+d}$	$\frac{a}{ax} = x$	$\frac{a}{b} \cdot \frac{c}{d} = \frac{ad}{bc}$
$\frac{a}{x^{-n}} = x^n$	$\frac{a}{b} \cdot \frac{c}{d} = \frac{bc}{ad}$	$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$

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- It needs to be neat and clean.
- Please use a ruler.

Function	Graph	Domain (Set)	Domain (Int.)	Range (Set)	Range (Int.)
$f(x) = [x]$		$x x \in \mathbb{R}$	$(-\infty, \infty)$	$f(x) f(x) \in \mathbb{Z}$	$[f(x)]$
$f(x) = c$		$x x \in \mathbb{R}$	$(-\infty, +\infty)$	$f(x) f(x) = c$	$[f(x)]$
$f(x) = x$		$x x \in \mathbb{R}$	$(-\infty, +\infty)$	$f(x) f(x) \in \mathbb{R}$	$(-\infty, +\infty)$
$f(x) = x $		$x x \in \mathbb{R}$	$(-\infty, +\infty)$	$f(x) f(x) \geq 0$	$[0, +\infty)$
$f(x) = x^2$		$x x \in \mathbb{R}$	$(-\infty, +\infty)$	$f(x) f(x) \geq 0$	$[0, +\infty)$
$f(x) = \sqrt{x}$		$x x \geq 0$	$[0, +\infty)$	$f(x) f(x) \geq 0$	$[0, +\infty)$

Function	Graph	Domain (Set)	Domain (Int.)	Range (Set)	Range (Int.)
$f(x) = \frac{1}{x}$		$x x \in \mathbb{R}, x \neq 0$	$(-\infty, 0) \cup (0, +\infty)$	$f(x) f(x) \in \mathbb{R}, y \neq 0$	$(-\infty, 0) \cup (0, +\infty)$
$f(x) = x^3$		$x x \in \mathbb{R}$	$(-\infty, +\infty)$	$f(x) f(x) \in \mathbb{R}$	$(-\infty, +\infty)$
$f(x) = \sqrt[3]{x}$		$x x \in \mathbb{R}$	$(-\infty, +\infty)$	$f(x) f(x) \in \mathbb{R}$	$(-\infty, +\infty)$
$y = b^x$ when $b > 1$ Exponential Growth		$x x \in \mathbb{R}$	$(-\infty, +\infty)$	$f(x) f(x) > 0$	$(0, +\infty)$
$y = b^x$ when $0 < b < 1$ Exponential Decay		$x x \in \mathbb{R}$	$(-\infty, +\infty)$	$f(x) f(x) > 0$	$(0, +\infty)$
$f(x) = \log_b x$ when $b > 1$ Logarithmic Growth		$x x > 0$	$(0, +\infty)$	$f(x) f(x) \in \mathbb{R}$	$(-\infty, +\infty)$
$f(x) = \log_b x$ when $0 < b < 1$ Logarithmic Decay		$x x > 0$	$(0, +\infty)$	$f(x) f(x) \in \mathbb{R}$	$(-\infty, +\infty)$