

## Honors Pre-Calculus Unit 0 Review

Welcome to Honors Pre-Calculus! This review assignment is designed to refresh your Algebra skills, review previously taught Math 3 concepts and give you a brief introduction to topics that you will expand upon in Honors Pre-Calculus. The topics that will be covered in this course can be abstract, but they have practical application and serve as a foundation for further study in Calculus and other college level mathematics courses.

The assignment is to be completed and turned in by Friday 8/28. To help you with this assignment, use your Math 3 resources, the internet or attend after-school tutoring with Ms. Hollister. You MUST show all work (on separate binder paper if you wish) in order to receive credit!

**\*\*Your Unit 0 Assessment will be on Monday 8/31.\*\***

1. Evaluate the function at each specified value. Simplify all answers.

$$f(x) = x^2 + 1$$

a.  $f(-3)$

b.  $f(x-1)$

c.  $f(b^3)$

1a.)  $f(-3) = 10$

1b.)  $f(x-1) = x^2 - 2x + 2$

1c.)  $f(b^3) = b^6 + 1$

2. Evaluate the function at each specified value. Simplify all answers.

$$f(x) = \begin{cases} 2x + 1 & x \leq -1 \\ x^2 + 2 & x > -1 \end{cases}$$

a.  $f(-2)$

b.  $f(-1)$

c.  $f(0)$

d.  $f(2)$

2a.)  $f(-2) = -3$

2b.)  $f(-1) = -1$

2c.)  $f(0) = 2$

2d.)  $f(2) = 6$

3. Write the domain & range of each function shown. Make sure to use interval notation.

a.  $f(x) = \sin x$

b.  $f(x) = 2\sqrt{x+3} - 6$

c.  $f(x) = x^3 - 3x$

3a.)  $D: (-\infty, \infty)$

$R: [-1, 1]$

$D: [-3, \infty)$

$R: [-6, \infty)$

$D: (-\infty, \infty) \text{ All } \mathbb{R}$

$R: (-\infty, \infty) \text{ All } \mathbb{R}$

(Hint: press Zoom Trig)

4. Identify the key features of each function shown below. Round all decimals to the hundredths place. If a feature does not apply, write N/A.

a.  $f(x) = x^3 - 3x$

Rel. max:  $(-1, 2)$

Rel. min:  $(1, -2)$

Increasing interval(s):  $(-\infty, -1) \cup (1, \infty)$

Decreasing interval(s):  $(-1, 1)$

Even/odd/neither: **odd**

Left end behavior:  $-\infty$

Right end behavior:  $+\infty$

b.  $f(x) = x^2 + 6$

Rel. max: **N/A**

Rel. min:  $(0, 6)$

Increasing interval(s):  $(0, \infty)$

Decreasing interval(s):  $(-\infty, 0)$

Even/odd/neither: **even**

Left end behavior:  $+\infty$

Right end behavior:  $+\infty$

c.  $f(x) = -3x^3 + 20x^2 - 36x + 16$

Rel. max:  $(3.19, 7.30)$

Rel. min:  $(1.25, -3.61)$

Increasing interval(s):  $(1.25, 3.19)$

Decreasing interval(s):  $(-\infty, 1.25) \cup (3.19, \infty)$

Even/odd/neither: **neither**

Left end behavior:  $+\infty$

Right end behavior:  $-\infty$

5. Find the inverse of each function algebraically.

a.  $f(x) = \frac{7x+3}{8}$

b.  $f(x) = 4x^3 - 3$

c.  $f(x) = \sqrt{x+10}$

5a.)  $f^{-1}(x) = \frac{8x-3}{7}$

5b.)  $f^{-1}(x) = \sqrt[3]{\frac{x+3}{4}}$

5c.)  $f^{-1}(x) = x^2 - 10$

6. Given the functions shown, name the original parent function AND describe the transformations that occurred to produce the new function  $j(x)$ .  $f(x) = x^2$        $g(x) = \sqrt{x}$        $h(x) = |x|$

a.  $j(x) = -(x+2)^2 - 6$       b.  $j(x) = 2\sqrt{x} + 3$       c.  $j(x) = -\frac{1}{2}|x-5| - 7$

6a.) Quadratic; reflect over x-axis, left 2, down 6

6b.) Square root; stretch by a factor of 2, up 3

6c.) Absolute value; reflect over x-axis, compress by factor of 1/2, Right 5, down 7

7. Simplify each expression.

a.  $\sqrt{-12} - \sqrt{-48}$

b.  $(3-2i)^3$

c.  $\frac{1}{4-\sqrt{7}}$

7a.)  $\frac{-2i\sqrt{3}}{4+\sqrt{7}}$       7b.)  $\frac{-9-46i}{m^2}$

7c.)  $\frac{4+\sqrt{7}}{9}$       7d.)  $\frac{m^2}{2n}$

d.  $\frac{\sqrt[3]{64m^9n^3}}{\sqrt{64m^2n^4}}$

e.  $4(3+4i) - 5i(1+i)$

7e.) 17 + 11i

8. Factor each polynomial shown.

a.  $2x^2 - 3x - 2$

b.  $a^2 - 4ab + 4b^2$

c.  $16x^2 - 8x + 1$

8a.)  $\frac{(x-2)(2x+1)}{(4x-1)^2}$

8b.)  $\frac{(a-2b)(a-2b)}{(4x-1)^2}$

8c.)  $\frac{(4x-1)^2}{(4x-1)^2}$

d.  $36x^2 - 100y^2$

e.  $6x^2 + 5x - 6$

f.  $72x^2 + 50$

8d.)  $\frac{4(3x-5y)(3x+5y)}{(2x+3)(3x-2)}$

8e.)  $\frac{(2x+3)(3x-2)}{(2x+3)(3x-2)}$

8f.)  $\frac{2(6x+5i)(6x-5i)}{8x(x-4)(x+4)}$

g.  $8x^2 - 4x - 24$

h.  $8x^3 - 128x$

8g.)  $\frac{4(x-2)(2x+3)}{8x(x-4)(x+4)}$

8h.)  $\frac{8x(x-4)(x+4)}{8x(x-4)(x+4)}$

9. Solve the following equations for x using the best method.

a.  $12x^2 + 12 = 25x$

b.  $x^2 + 4x = 7$

c.  $2x^3 + 2x^2 - 4x - 4 = 0$

9a.)  $x = \frac{4}{3}, \frac{3}{4}$

9b.)  $x = -2 \pm \sqrt{11}$

9c.)  $x = \pm\sqrt{2}$      $x = -1$

10. If  $P(x) = 4x^3 - 5x^2 + 1$ , use The Remainder Theorem to evaluate:

a.  $P(2)$

b.  $P\left(\frac{1}{2}\right)$

10a.)  $P(2) = 13$

10b.)  $P\left(\frac{1}{2}\right) = \frac{1}{4} = 0.25$

11. If -2 is a zero of the polynomial  $P(x) = 2x^3 + x + k$ , find the value of k.

11.)  $k = 18$

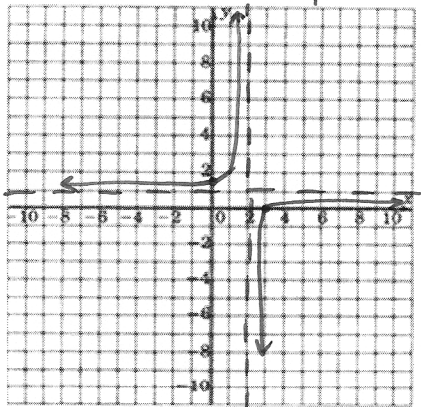
12. Two roots of the equation  $x^4 + x^3 - 5x^2 + x - 6 = 0$  are (2,0) and (-3,0). Find the remaining roots.

12.)  $(i,0)$  &  $(-i,0)$

13. Identify the key features of each rational function shown and graph. If a feature doesn't apply, write N/A.

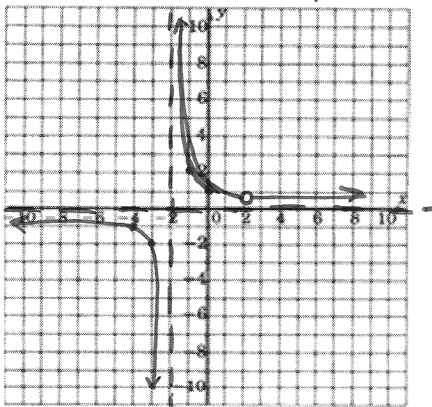
a.  $f(x) = \frac{x-3}{x-2}$

x-intercept(s): (3, 0)  
 y-intercept: (0, 1.5)  
 Holes(s): N/A  
 Horizontal Asym:  $y = 1$   
 Vertical Asym:  $x = 2$   
 Domain:  $x \in \mathbb{R}$  except 2



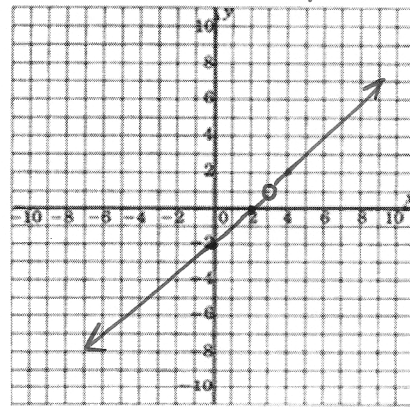
b.  $f(x) = \frac{2x-4}{x^2-4}$

x-intercept(s): N/A  
 y-intercept: (0, 1)  
 Holes(s): (2, 0.5)  
 Horizontal Asym:  $y = 0$   
 Vertical Asym:  $x = -2$   
 Domain:  $x \in \mathbb{R}$  except 2 & -2



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

x-intercept(s): (2, 0)  
 y-intercept: (0, -2)  
 Holes(s): (3, 1)  
 Horizontal Asym: None  
 Vertical Asym: N/A  
 Domain:  $x \in \mathbb{R}$  except 3



14. Simplify the following expressions:

a.  $\frac{x^2+7x+12}{x^2+2x-8}$

b.  $\frac{x^2-64}{2x+16} \cdot \frac{x+8}{x^2+16x+64}$

c.  $\frac{3}{8x^3y^3} - \frac{1}{4xy}$

d.  $\frac{2x}{x^2-x-2} + \frac{4x}{x^2-3x+2}$

e.  $\frac{1+\frac{2}{x}}{4-\frac{6}{x}}$

14a.)  $\frac{x+3}{x-2}$

14b.)  $\frac{x-8}{2(x+8)}$

14c.)  $\frac{3-2x^2y^2}{8x^3y^3}$

14d.)  $\frac{2x(3x+1)}{(x-2)(x+1)(x-1)}$

14e.)  $\frac{x+2}{2(2x-3)}$

15. Solve and check for extraneous solutions

$\frac{4}{x-2} = \frac{7}{x^2+3x-10} - \frac{3}{x+5}$

15.)  $x = -1$

16. Solve each equation

a.  $3^x = 31$

b.  $\log_2(x-2) + \log_2(x+5) = 1$

c.  $\ln(x-6) = 12$

16a.)  $x = 3.13$

16b.)  $x = 2.27$

16c.)  $x = 162,760.79$

17. A gallon of gasoline cost \$3.09 two years ago. Now it costs \$2.59. To the nearest percent, what has been the annual rate of decrease in the cost?

17.)  $r = 8\%$

18. Suppose \$1,200 is invested in a bank account at an interest rate of 9.6%. How much is the investment worth after 2 years if the interest is compounded:

a. Monthly?

b. Continuously?

18a.) \$1,452.89

18b.) \$1,454.00

19. Find the exact value of each log shown using the Change of Base formula.

a.  $\log_2 16$

b.  $\log_{27} 3$

c.  $\log 0.25$

19a.) 4

19b.) 1/3

19c.) -0.60