Name: _____ PreCal Honors Summer Packet

Date: _____

Topics:

I. Trigonometry
II. Quadratic Functions and Polynomials
III. Exponentials and Logarithms
IV. Graphs of Functions and their Transformations

This packet is due on the first day of school. It will be graded, and there will be an opportunity for you to ask questions about the material. Then you will be given a test within a few days.

For all problems, you should show work as appropriate! Answers without proper work shown will not receive credit.

I. Trigonometry

For #1 - 8 round lengths to 3 significant digits and angles to the nearest tenth of a degree. Note that these problems use the convention that the names of sides are correlated with the opposite angles so that side *a* is opposite angle A, side *b* is opposite angle B, etc.

1. Solve for side *b* and $\angle A, \angle B$ given a right triangle with $a = 230$, $c = 320$, $\angle C = 90^\circ$.

2. Solve for sides *a* and *b* and $\angle B$ given a right triangle with $c = 68$, $\angle A = 36.2^\circ, \angle C = 90^\circ$.

3. What is the angle of elevation of the sun when a tree 6.25 m tall casts a shadow 10.1 m long?

4. The approach pattern to an airport requires pilots to set an 11° angle of descent (angle of depression) toward the runway. If a plane is flying at an altitude of 9500 m, at what distance (measured along the ground) from the airport must the pilot start the descent?

Using Law of Sines and/or Law of Cosines, solve for the missing sides/angles of the triangles in #5 - 8 given that you know the following:

5. $a = 6,\ b = 7,\ \angle C = 20^\circ$

6. $a = 5,\ c = 7,\ \angle A = 42^\circ$

7. $a = 14,\ \angle A = 25^\circ,\ \angle B = 75^\circ$

8. $a = 13,\ b = 30,\ c = 40$

II. Quadratic Functions and Polynomials

Give all answers in simplest radical form. (No decimals!) These calculations should all be done without a calculator.

9. Solve $(3x+1)^2 = 8$

10. Find the domain, range and zeros of $g(x) = x^2 - 6x + 4$.

11. Two positive real numbers have a sum of 7 and a product of 11. Find the numbers.

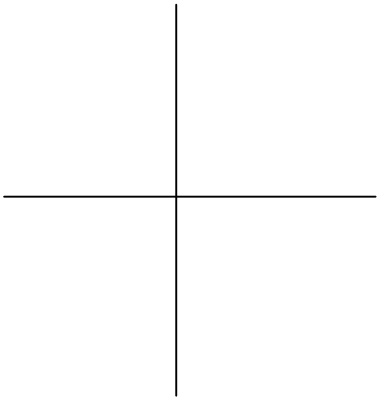
12. Find a quadratic equation with integral (i.e. integer) coefficients having roots $\frac{1+\sqrt{3}}{4}, \frac{1-\sqrt{3}}{4}$.

13. Find a quadratic function $f(x) = ax^2 + bx + c$ having minimum value – 9 and zeros ½ and – 5/2.

14. Solve $y^4 + y^2 = 12$.

15. Solve $3z + 2\sqrt{3z} - 8 = 0$.

16. Write the equation of a polynomial with the following properties; then sketch it.
    - x = 2 is a root with multiplicity 1
    - x = -3 is a root with multiplicity 2
    - x = 0 is a root with multiplicity 2
    - The leading coefficient is -4



Equation: _____

III. Exponentials and Logarithms

For these problems, no calculator except for #24.

17. Simplify the following as much as possible:

a. $\sqrt[3]{\sqrt{125y^6}}$

b. $\left(64^{2/3}+27^{2/3}\right)^{3/2}$

c. $5^{\log_5 3}$

d. $\log_3 27^{\sqrt{2}}$

e. $\ln\frac{1}{e^3}$

f. $\log_6\left(\frac{36}{6^{-10}}\right)$

18. Solve for x:

a. $\left(\frac{1}{16}\right)^{-3/4} = x$

b. $27^x = 81$

c. $4^{x-2} = 8^{\pi+1} \div 8^{\pi-1}$

d. $\log_3 x = \log_3 12 + \log_3 2 - \log_3 6$

e. $\log_4 (x-6) + \log_4 x = 2$

19. Suppose $f(x) = 2x - 1,\ g(x) = x^2 + 4$. Find:

a. $f(g(-2))$

b. $g(f(x))$

20. Suppose that $f(x) = \sqrt[3]{x-1}$ and $g(x) = x^3 + 1$. Show that *f* and *g* are inverse functions.

21. Solve for *x* in terms of natural logs: $e^{2x-1} = 3$

22. Solve for *t* in terms of log base 10: $10^{5t} = 2$

23. Solve for *x* in terms of *e*: $\ln x^2 = 8$

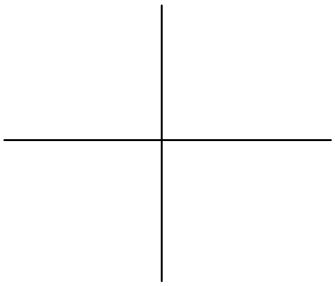
24. The population of a certain colony of bacteria doubles every 5 hours. How long will it take for the population to triple? Give the answer to two significant digits. (Calculator ok)

IV. Functions and Transformations Graphs

(No calculator)

25. Sketch the following and state their domain and range.

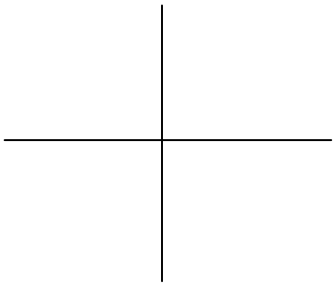
$y = x^2$



Domain: _____

Range:

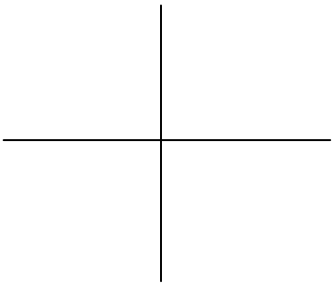
$y = x^3$



Domain: _____

Range: _____

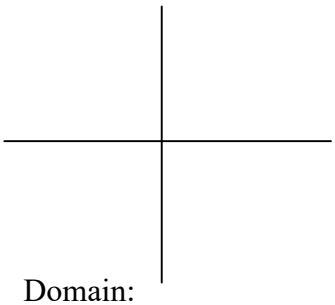
$y = x^4$



Domain: _____

Range: _____

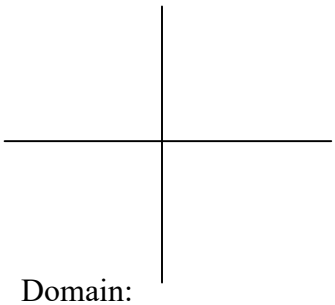
$y = \sqrt{x}$



Domain: _____

Range: _____

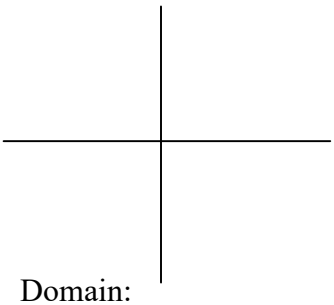
$y = \sqrt[3]{x}$



Domain: _____

Range: _____

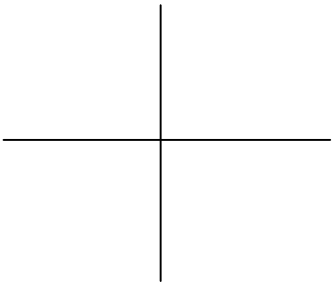
$y = 1/x$



Domain: _____

Range: _____

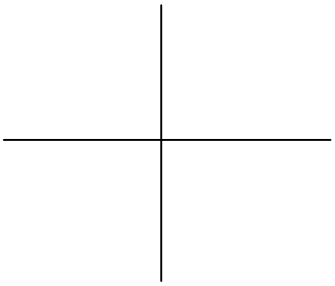
$y = 1/x^2$



Domain: _____

Range: _____

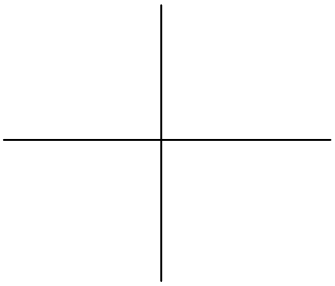
$y = e^x$



Domain: _____

Range: _____

$y = \ln x$

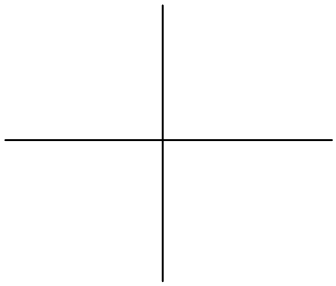


Domain: _____

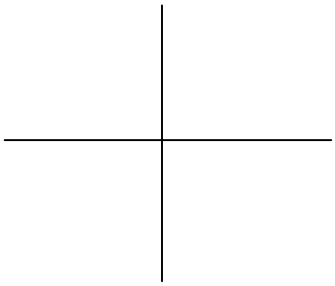
Range: _____

26. Graph the following transformed functions. Show enough detail/labeling to indicate that the basic shape of the graph and the transformations that have taken place.

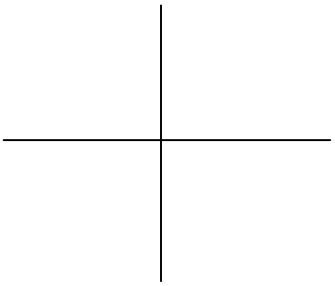
$y = -\ln(x-1)$



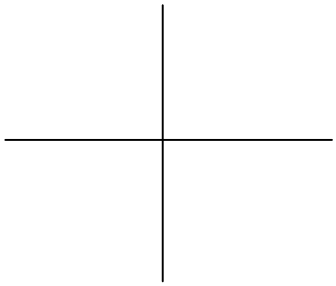
$y = e^{x} - 2$



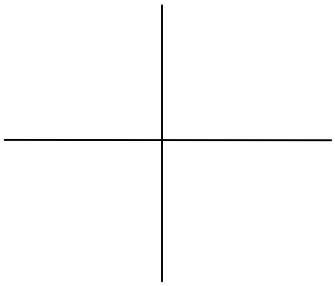
$y = 2\sqrt[3]{-x}$



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



$y = 2^{-x}$



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