Summer Math Review 2017

For Section 11 Honors

- *You should not use a calculator for this work, except for question 17.*
- *Work on a separate sheet of paper.*
- *Show all work.*

1. Solve:

   a. $x - 3(2x + 5) = 7$

   b. $2x^2 = 4x - 3$

   c. the system $3x - 6y = 10$ and $5x + 3y = 21$

   d. $2 = x + \sqrt{x + 10}$

   e. $2x^2 + 8x + 5 = 0$

   f. $x^3 + 6x^2 + 13x + 10 = 0$ ($x = -2$ is one solution)

2. Graph on a number line the solutions of $4y + 6 > 7y - 15$.

3. Find the domain and range of the function defined by the equation $y = 5(4)^x$.

4. Consider the function $f(x) = \frac{2x + 3}{3x - 5}$.

   a. What is its domain?

   b. What is its range?

   c. If it has any vertical asymptotes, what are their equations?

   d. If it has any horizontal asymptotes, what are their equations?

5. Complete the following sentence:

   A graph is not the graph of a function if two of its points are _____.

6. If $f(x) = 8-x$ and $g(x) = x^2$, find the value of the function $f(g(3))$.

7. The slope of the line through $(a + 2, 5)$ and $(3a-1, 7)$ is $\frac{4}{3}$. Find the value of a.

8. Factor $48x^4 - 3$.

9. Simplify:

    a. $(2-6i)(3 + 4i)$

    b. $(2i - 7)^2$

    c. $(g + 2)(g + 2)(g - 2)(g - 2)$

    d. $\sqrt{24x^5y^6z}$

    e. $\sqrt{12} + \sqrt{75}$

    f. $\dfrac{3}{x+5} + \dfrac{2}{x+1}$

    g. $\dfrac{x^2 - x - 6}{x^2 - 7x + 12}$

    h. $\dfrac{\frac{3}{x-1}}{2-\frac{x-2}{x-1}}$

    i. $\dfrac{1}{2-\frac{1}{2-\frac{1}{2-\frac{1}{2}}}}$

10. Find the value of x, given $\left(\sqrt[3]{16}\right)\left(\sqrt[4]{8}\right) = 2^x$

11. Find the vertex of the graph of $y = 2x^2 + 8x + 3$.

12. Find $\log_3 243$.

13. Simplify: $\log_2 32 - \log_2 4$.

14. Expand: $\log_5(x \cdot \sqrt[3]{y})$.

15. Find z, given that $(3x + 7)(3x + 7)(3x + 7)^z = (3x + 7)^9$.

16. A ship leaves a port and sails north-east for 7.5 miles and then sails north-west for 10 miles. How far away is the ship from the port?

17. Shira is standing 43 meters away from the base of a skyscraper and she is told that it is 103.5 meters tall. Her eyes are 1.5 meters above the ground as she looks at the top of the building. What is the angle of elevation from her eyes to the top of the building? Give your answer to the nearest tenth of a degree.

18. The length of a rectangle is 3 times its width. If the width is increased by 1 m and the length is increased by 10 m, its area is doubled. Find the measurements of the original rectangle.

19. For the pictured triangle, find the exact values of sine, cosine, and tangent for the labeled angle.
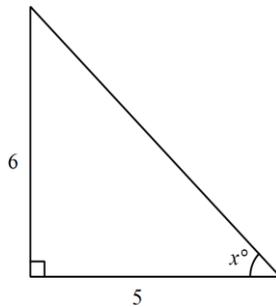
20. Find the three smallest numbers with exactly four different prime factors.

21. If a can take any value between 2 and 4 inclusive, and b can take any value between 4 and 5 inclusive, find the greatest possible value of
$$\frac{1}{a^2} - \frac{1}{b^2}$$

22. The mean of the numbers 3, 5, a, 2, 9 and 7 is b. If the number c in added to the group, the mean increases by 2. Find an equation for c in terms of b.

23. Graham covered the first half of the distance in a third of the time it took him to get from his house to his parents' house. Given that his average speed for the second part of the journey was 30 miles per hour and the whole journey took 3 hours, how far does Graham live from his parents?

24. If a car has p gallons of gas in the tank it can travel a miles. With v gallons of gas in the tank it can travel b miles. Find an expression for v in terms of p, b and a.