Math 105 - Practice Final Exam **Name:** _____

Simplify the following as much as possible.

1. $3[2 - 4(5 - 7)]$

2. $\dfrac{1}{a} - \dfrac{3}{b}$

3. $(-4a)^2$

4. $5^0 4^{-2}$

5. $(5x^2y)(-4x^2y^3)$

6. $4x - 2(x - 1) + 4(y - 2)$

7. $\dfrac{4}{2 + \frac{1}{2}}$

8. $\dfrac{3x - 4x^2}{3x}$

9. $\sqrt{20x^6y^8}$

10. $\dfrac{18x - 6}{3x - 1}$

11. $\left(\dfrac{4\pi r^3}{3m}\right)^{-2}$

12. $\dfrac{x^2-9}{9x} \cdot \dfrac{6}{2x-6}$

Solve the following equations and inequalities.

13. $\dfrac{10}{x} = \dfrac{4}{3}$

14. $7 + 2x = 5 - 3x$

15. $\dfrac{1}{x-3} + 3 = \dfrac{x}{x-3}$

16. $5x - 4 < 2x + 5$

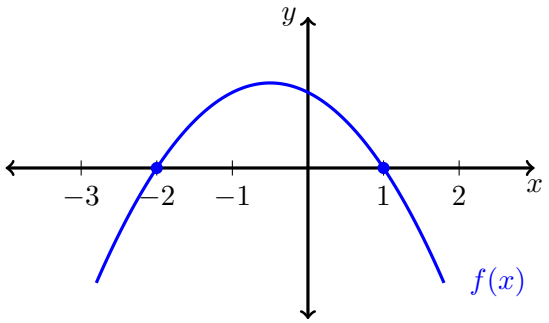
17. $x^2 - 12x + 32 = 0$

18. $x^2 - 4x + 9 \geq 6$

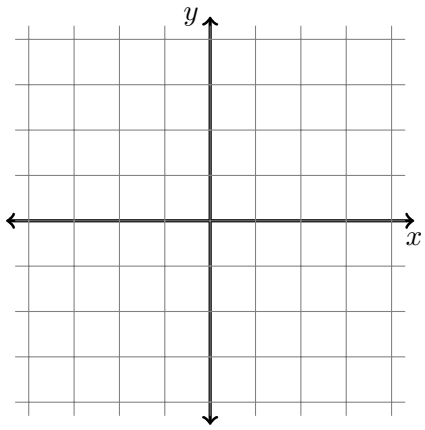
19. $(x-5)(x+3) = 20$

20. $\log_2(x) = -3$

21. The graph of a function $f(x)$ is shown below. For what values of x is $f(x) < 0$?



22. Graph the equation $2y - x = 4$ on the axes below.



23. Find the x-value where the lines $6x + 5y = 3$ and $y = 2x + 7$ cross.

24. A ship's anchor is being raised by an electric winch. The anchor weighs 100 pounds and it is attached to a chain that weighs 2 pounds per foot. The combined weight of the anchor and the chain is $W(x) = 100 + 2x$ where x is the length of the remaining chain in feet. Initially the chain is 50 feet long, but it is being wound up so that its current length is $x(t) = 50 - \frac{t}{2}$ where t is the time in seconds. Compute $W(x(60))$.

25. What is the inverse of the weight function $W = 100 + 2x$ from the previous problem? In addition to the formula, you should explain what the inverse function computes.