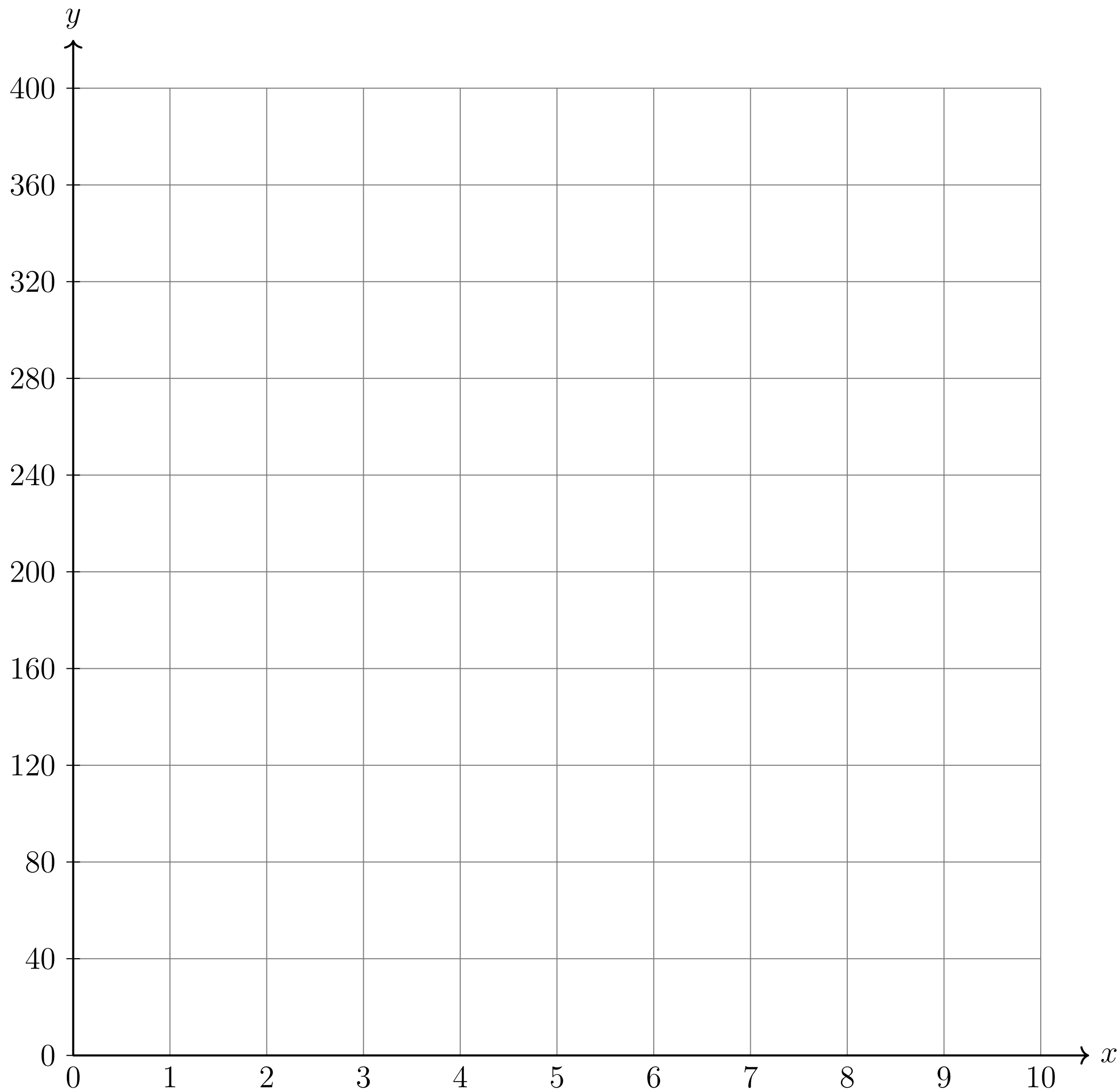
BECA/Huson/Algebra 2: Regents Preparation Name:
3 June 2024

Prep #22 Quiz: Graphing

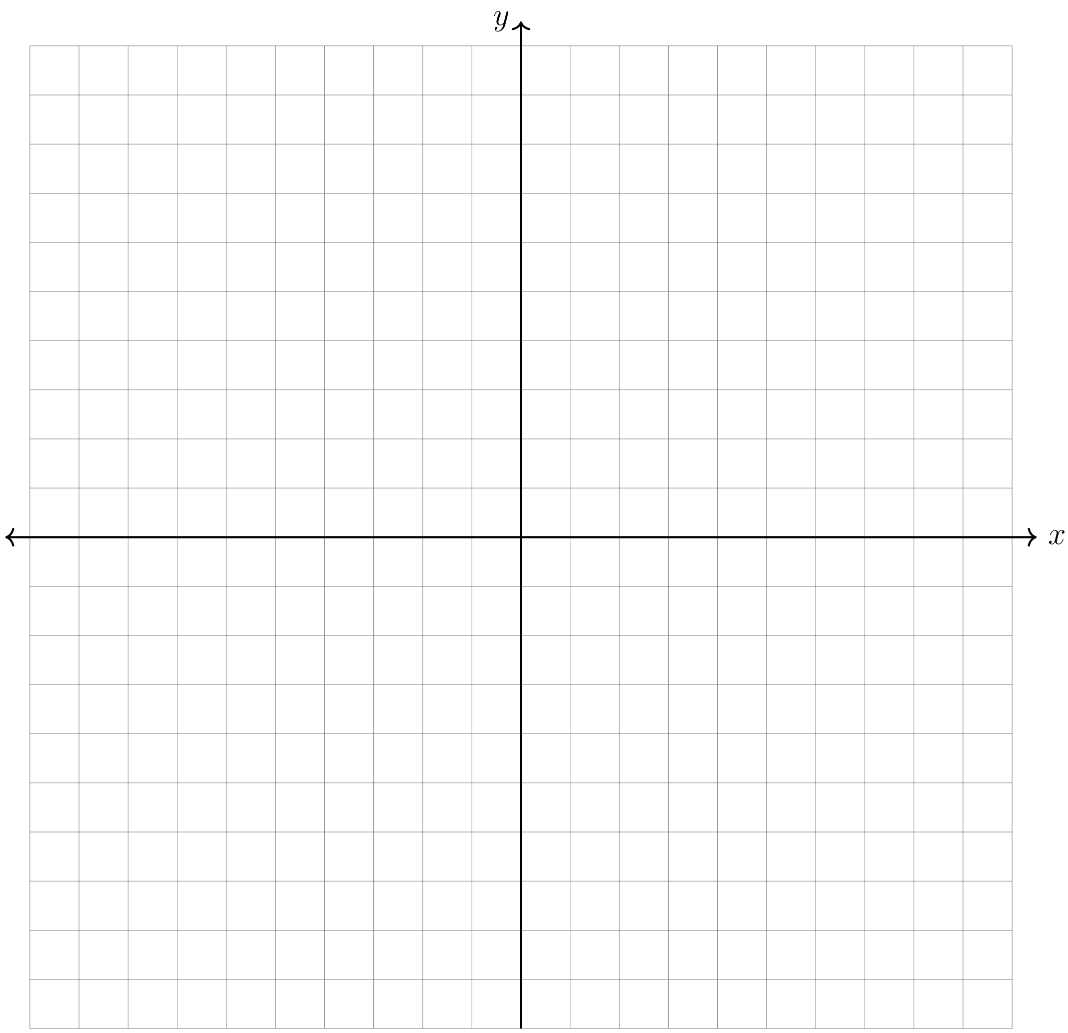
1. Graph $f(x) = 80(1.2)^x$ on the set of axes below.



(a) Draw a horizontal line at $y = 240$ and approximate the x-value where it intersects the curve.

(b) Using the calulator, find the x-value where $f(x) = 240$ to the *nearest hundredth.*

2. Graph the functions $f(x) = x^2 + x - 5$ and $g(x) = -x + 3$ on the set of axes below. Mark their intersections and label the points as ordered pairs.



Check your work:

- ☐ The parabola is drawn precisely and is a smooth curve.
- ☐ The line is drawn with a ruler and has the correct y-intercept.
- ☐ There are arrows on the ends of the lines if appropriate.
- ☐ The intersections are marked with points and labeled with ordered pairs. (parentheses)

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3. A study of black bears in the Adirondacks reveals that their population can be represented by the function $P(t) = 3500(1.025)^t$, where t is the number of years since the study began. Rewrite the function to reveal the monthly growth rate of the black bear population.

4. A student studying public policy created a model for the population of Detroit, where the population decreased 25% over a decade. He used the model $P = 714(0.75)^d$, where P is the population, in thousands, d decades after 2010. Another student, Suzanne, wants to use a model that would predict the population after y years.

   Suzanne's model is best represented by what equation?

5. Jasmine decides to put \$100 in a savings account. The account pays 3% annual interest, compounded monthly.
   (a) Write a function equation to represent how much money, S, will Jasmine have after t years.

   (b) Calculate the acount balance after 1 year.

6. The function $p(t) = 110e^{0.03922t}$ models the population of a city, in millions, t years after 2010. As of today, consider the following two statements. Identify them as either true or false.

   T F The current population is 110 million.

T F The population increases continuously by approximately 3.9% per year.

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7. Convert between radical and rational exponent forms. (assume $x > 0$)

   (a) $\dfrac{(9x)^{\frac{1}{2}}y}{y^{\frac{1}{2}}} =$

   (b) $\dfrac{\sqrt[3]{8x^8}}{2\sqrt{x^4}} =$

8. Explain what a rational exponent, such as $\frac{3}{2}$ means. Use this explanation to evaluate $4^{\frac{3}{2}}$.

9. Simplify each complex expression to the form $a + bi$.

   (a) $i^2 =$

   (c) $(8 + 7i) - (5 + 3i) =$

   (b) $(2 - 2i)(10 + i) =$

   (d) $\dfrac{1}{3}i(\sqrt{-81} + 6i) + 5i =$

10. Find the solution to the equation

    $4x^2 + 98 = 0$

11. Solve algebraically for all values of x:

    $\sqrt{x-4} + x = 6$

12. The focal length, F, of a camera's lens is related to the distance of the object from the lens, J, and the distance to the image area in the camera, W, by the formula below.

    $$\frac{1}{J} + \frac{1}{W} = \frac{1}{F}$$

    Solve this equation for J in terms of F and W.

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13. Write a recursive formula for the sequence 18, 9, $4\frac{1}{2}$, ...

14. A sequence is defined by the recursive formula

$$a_1 = 6$$
$$a_n = 3a_{n-1}$$

Write an explicit formula for the sequence.

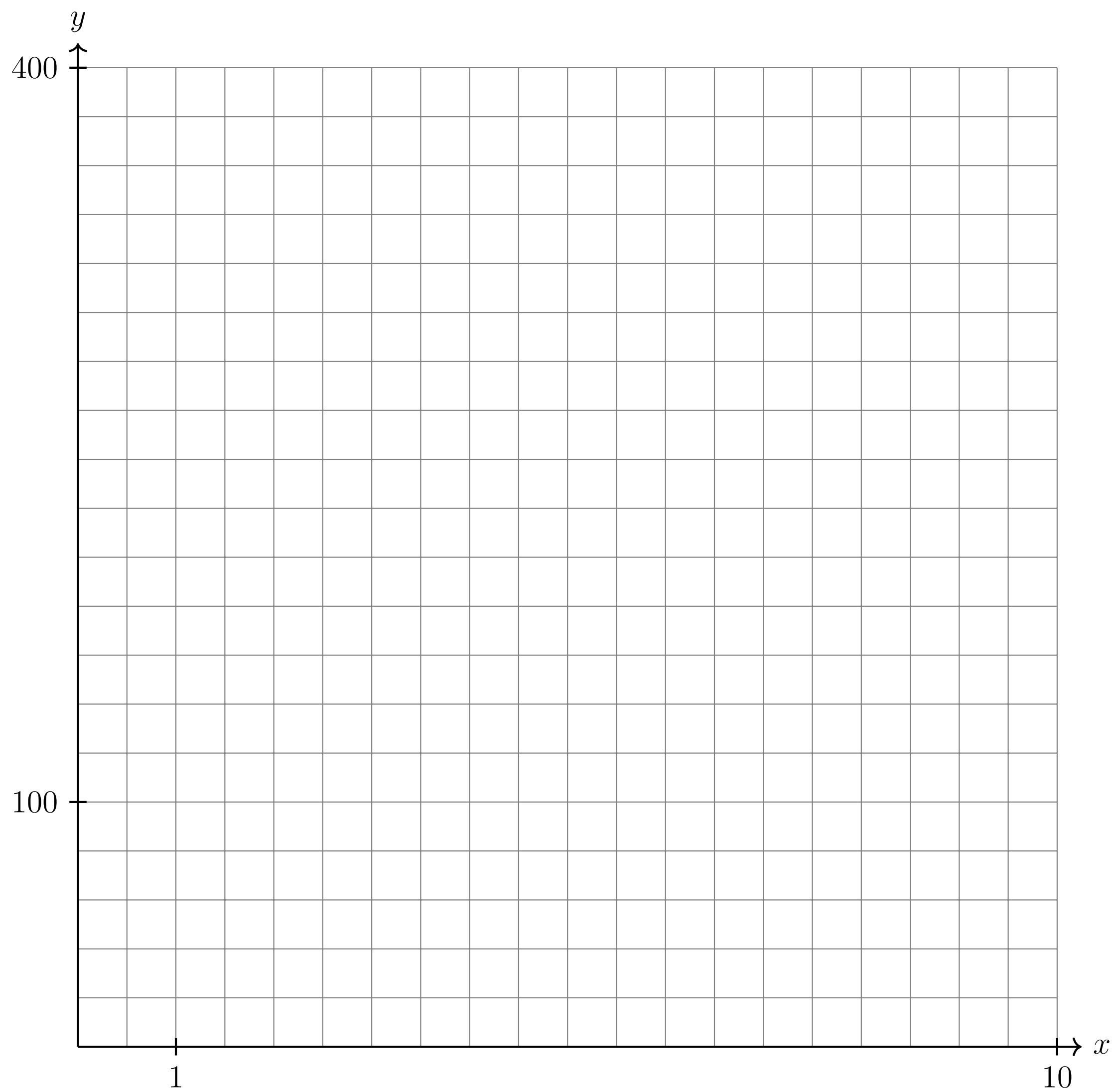
15. Kristin wants to increase her running endurance. According to computations. experts, a gradual mileage increase of 10% per week can reduce the risk of injury. If Kristin runs 8 miles in week one, write an expression can help her find the total number of miles she will have run over the course of her 6-week training program.

16. Complete the table for the geometric sequence a.

n	1	2	3	4	5
a_n	20	25			

Model the sequence with an exponential function.

17. Graph $y = 400(0.85)^{2x} - 6$ on the set of axes below.



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18. Determine for which polynomial(s) $(x+2)$ is a factor. Explain your answer.

$$P(x) = x^4 - 3x^3 - 16x - 12$$

$$Q(x) = x^3 - 3x^2 - 16x - 12$$

19. Over the set of integers, factor the expression $4x^3 - x^2 + 16x - 4$ completely.