29 May 2018 Name: .

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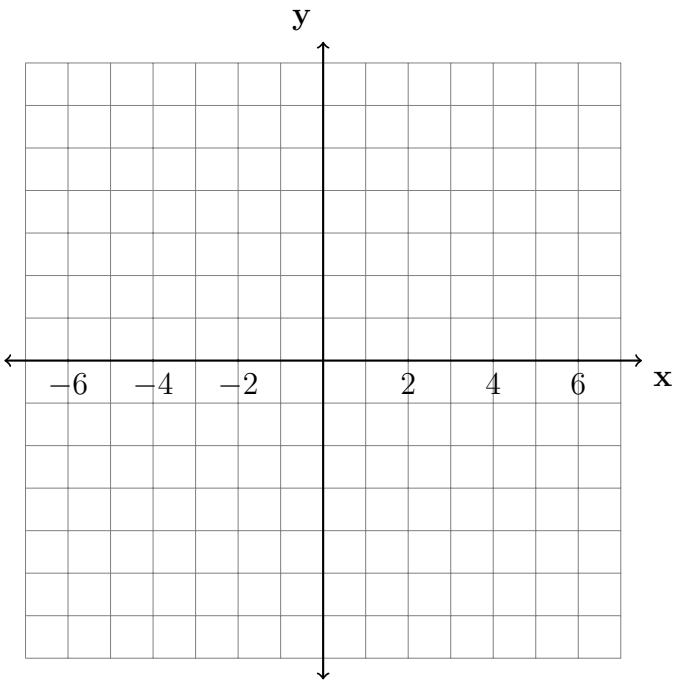
Graph carefully using pencil

1. Express $(1-2i)^3$ in $a+bi$ form.

2. Write $\sqrt{x^2} \bullet \sqrt{x^4}$ as a single term with a rational or integer exponent.

3. The polynomial $f(x)$ shown has a leading coefficient of 1. Write an equation for $f(x)$ in factored form.



The function g is formed by translating function f left 1 unit. Sketch $y = g(x)$ on the same grid.

29 May 2018 Name: .

Test Corrections: Complete all problems for full credit

4. Given: $f(x) = x^2 + 2x + 1$ and $g(x) = x - 1$
   Express $f(x) \bullet g(x) + f(x)$ as a polynomial in standard form.

5. When $x > 0$ and d is a positive integer, the expression $\left(27x^2\right)^{\frac{1}{3}}$ is equivalent to what expressed as a radical?

6. What are the zeros for $f(x) = x^4 + 5x^3 - 8x^2 - 12x$?

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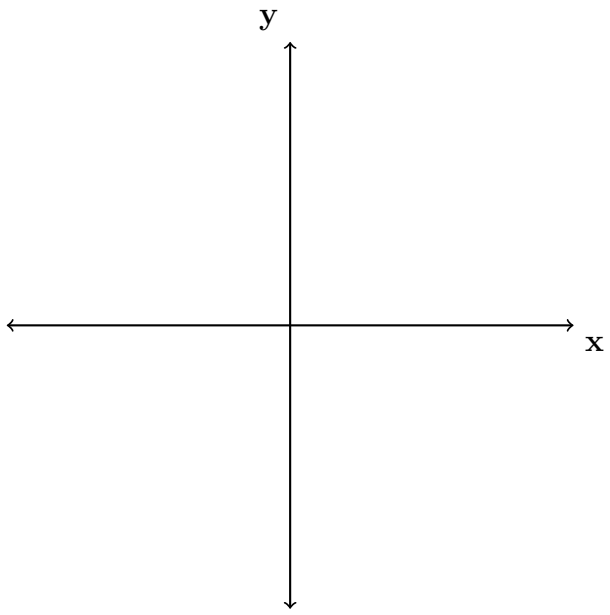
7. Sketch a graph of a cubic polynomial with the following characteristics:

   - three negative, real zeros
   - as $x \to +\infty$, $f(x) \to +\infty$
   - as $x \to -\infty$, $f(x) \to -\infty$

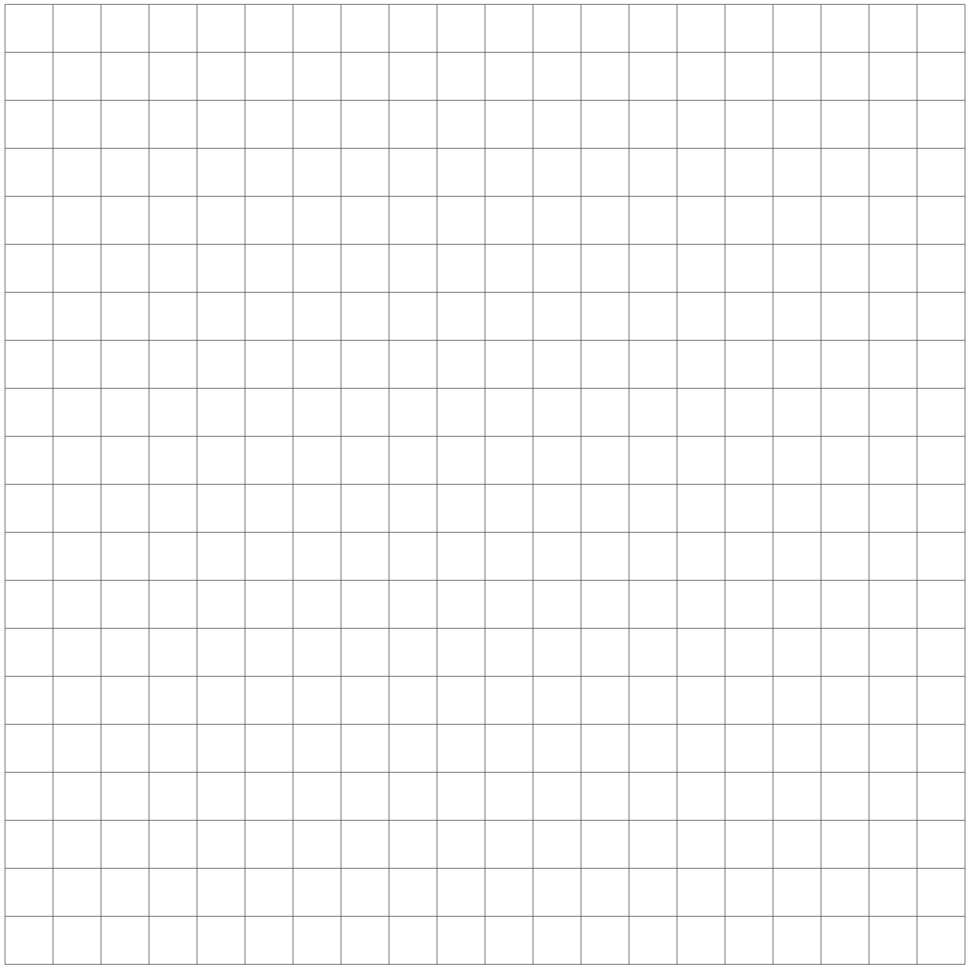


8. Algebraically determine the values of h and k to correctly complete the identity stated below.

$$2x^3 + 4x^2 + 8x + 6 = (2x + 2)(x^2 + hx + k)$$

29 May 2018 Name: .
Test Corrections: Complete all problems for full credit

9. The zeros of a cubic polynomial function f are $-3, 1,$ and 4. The polynomial has a negative leading coefficient, $a < 0$. Sketch a graph of $y = f(x)$ on the grid below.



Write an equation for $f(x)$ in factored form, assuming the leading coefficient is negative one.

29 May 2018 Name: .

Test Corrections: Complete all problems for full credit

10. Explain how $\left(\frac{8}{y^3}\right)^{\frac{1}{3}}$ is equivalent to $\frac{2}{y}$.

11. Given that the remainder when $f(x) = 2x^3 + 6x^2 + 5x + 1$ is divided by $x + 3$ is -14. What is the value of $f(-3)$?

12. Given i is the imaginary unit, $(1 - 2xi)^2$ in simplest form is what?

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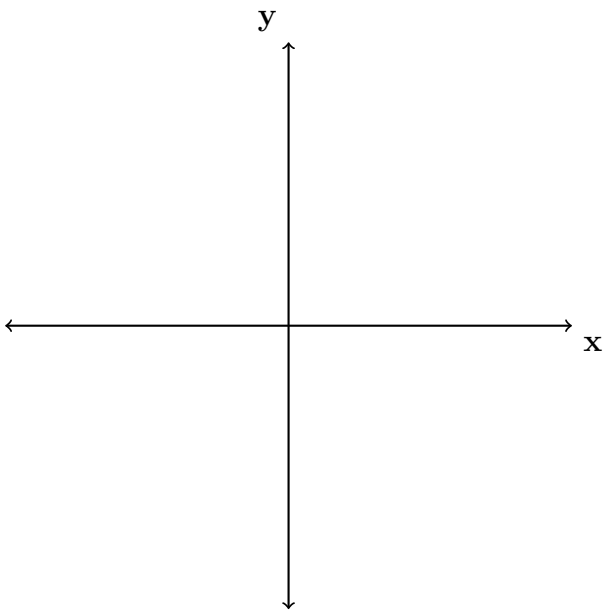
13. For the polynomial with graph shown, state

    (a) its degree

    (b) how many distinct zeros it has

    (c) the sign of its leading coefficient



14. Simplify the expression $\dfrac{6x^3 + 30x^2 - 9x}{3x}$, where $x \neq 0$.

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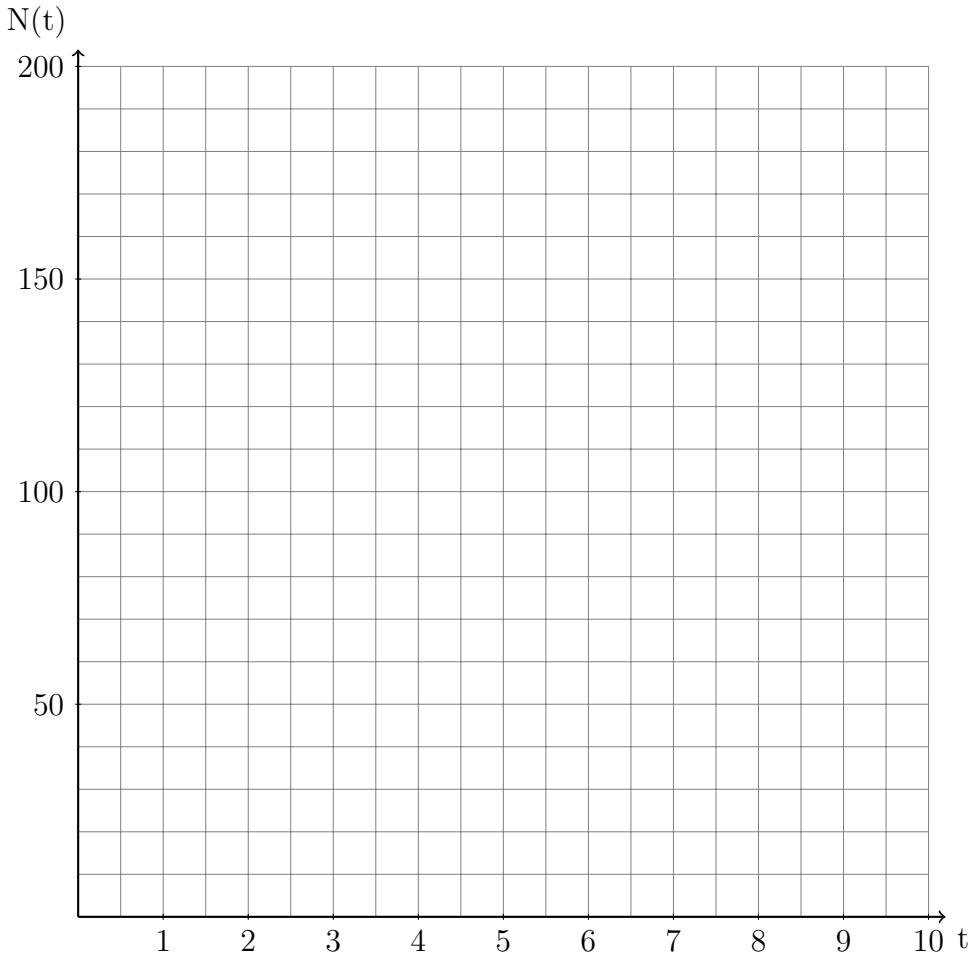
15. Given $N(t) = N_0(e)^{-rt}$, where $N(t)$ is the amount of a drug, N_0 is the initial dosage, r is the decay rate, and t is time in hours.

    For A, model $A(t)$ as an initial amount of 180 milligrams and decay rate of 0.22.

    For $B, B(t)$ is 75 milligrams initially with a decay rate of 0.08.

    Write equations for $A(t)$ and $B(t)$.

    Graph each function on the set of axes below.



    To the *nearest hour*, t, when will the two drugs be at equal levels?

    When will 145 milligrams of drug A remain, to the *nearest tenth of an hour*?

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16. Given $f(x) = 3x^2 + 7x - 20$ and $g(x) = x - 2$, state the quotient and remainder of $\dfrac{f(x)}{g(x)}$, in the form $q(x) + \dfrac{r(x)}{g(x)}$.

17. If $g(c) = 1 - c^2$ and $m(c) = c + 1$, then which statement is *not* true?

    (a) $g(c) \bullet m(c) = 1 + c - c^2 - c^3$

    (b) $g(c) + m(c) = 2 + c - c^2$

    (c) $m(c) - g(c) = c + c^2$

    (d) $\dfrac{m(c)}{g(c)} = \dfrac{-1}{1 - c}$

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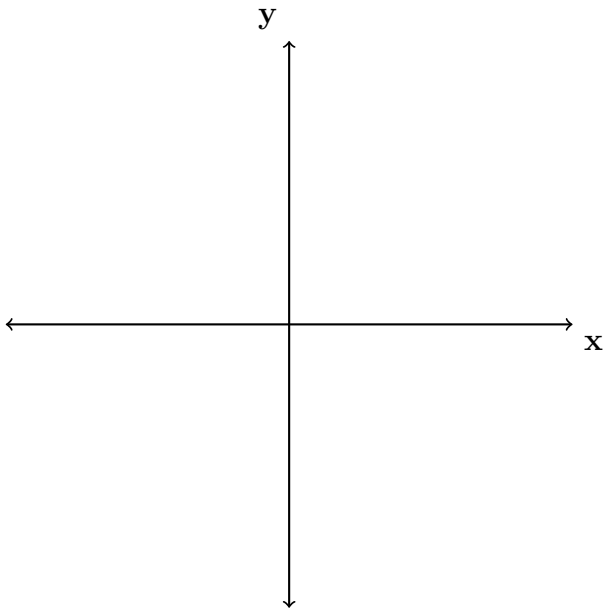
18. Sketch a graph with the following characteristics:

    - polynomial function of order four
    - a positive leading coefficient
    - four real zeros



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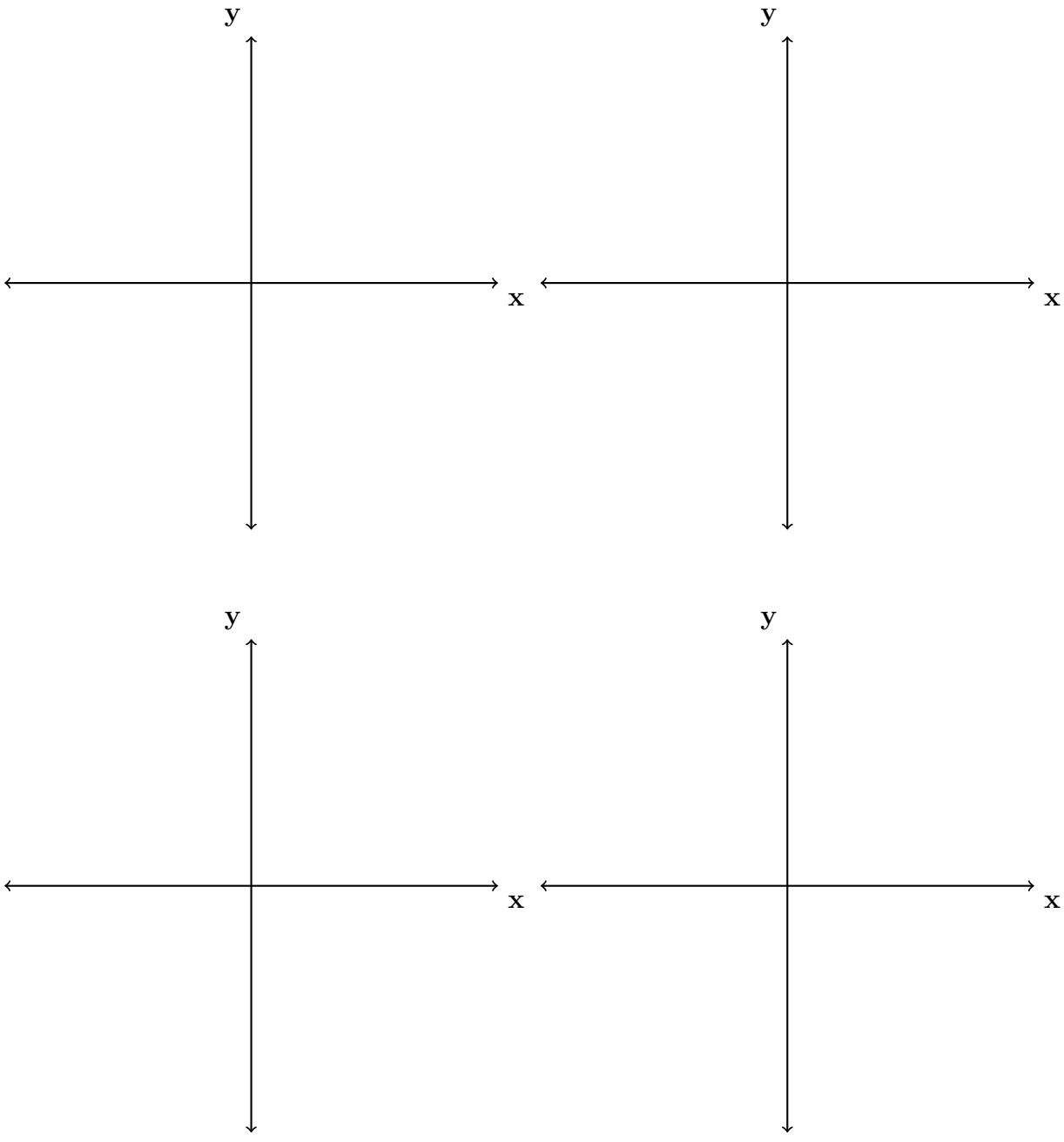
19. For each polynomial graph, state
    (a) its degree,
    (b) how many distinct zeros it has, and
    (c) the sign of its leading coefficient.



29 May 2018 Name: .

Test Corrections: Complete all problems for full credit

20. Solve for x: $\dfrac{1}{x} - \dfrac{1}{3} = -\dfrac{1}{3x}$

Solve with a calculator by graphing the left-hand side as $y1 = \dfrac{1}{x} - \dfrac{1}{3}$ and the right hand side as $y2 = -\frac{1}{3x}$. Then use the calculator graph-solve function.

To get full credit, show work by sketching the graph. Mark the intersection clearly with the x value. Write "graphical solution."