24 May 2018 Name: .

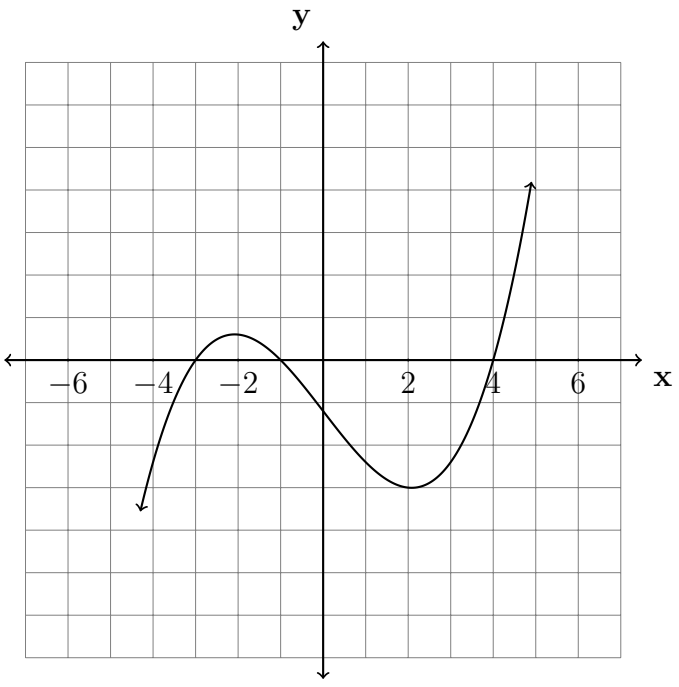
Take home test: Functions, exponents, & imaginary numbers

Open book & open note. No searching online for answers. No electronic calculators (no Desmos), only handhelds.

1. Simplify the expression $(2 + 2i)^2$, where i is the imaginary unit.

2. Write $\sqrt[3]{x^4} \bullet \sqrt[3]{x^2}$ 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 right 2 units. Sketch $y = g(x)$ on the same grid.

Take home test: Functions, exponents, & imaginary numbers

4. Given: $f(x) = 5x^2 - 2x + 1$ and $g(x) = x + 1$
   Express $f(x) \bullet g(x) + g(x)$ as a polynomial in standard form.

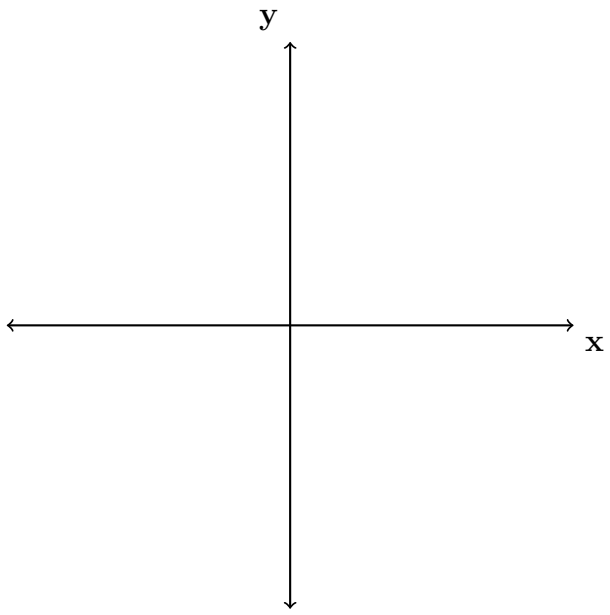
5. When $x > 0$ and d is a positive integer, the expression $(9x)^{\frac{d}{2}}$ is equivalent to what expressed as a radical?

6. What are the zeros for $f(x) = x^4+x^3-19x^2+11x+30$? (hint: graph it on the calculator)

Take home test: Functions, exponents, & imaginary numbers

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

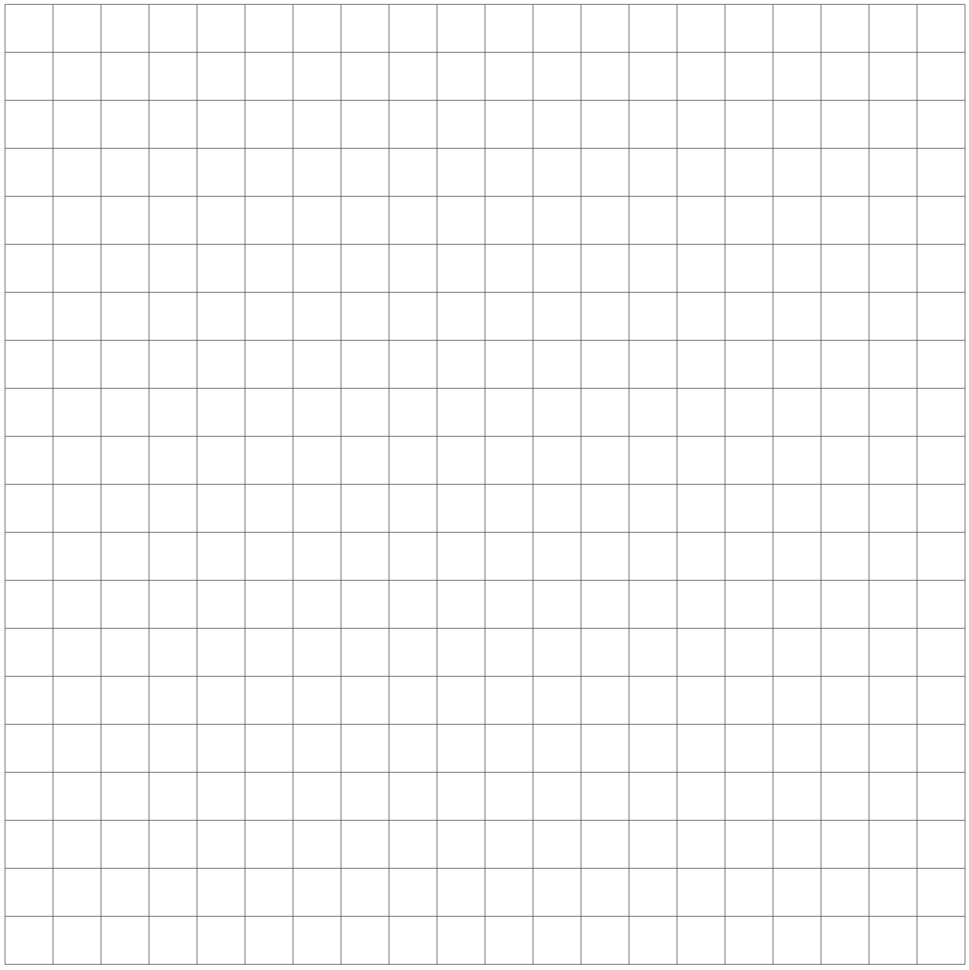
   - three positive, real zeros
   - as $x \to +\infty$, $f(x) \to -\infty$
   - as $x \to -\infty$, $f(x) \to +\infty$



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

$$x^3 + 3x^2 + 5x + 3 = (x + 1)(x^2 + hx + k)$$

9. The zeros of a cubic polynomial function f are $-5, 2,$ and 5. 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.

Take home test: Functions, exponents, & imaginary numbers

10. Explain how $\left(\frac{8}{y^3}\right)^{\frac{2}{3}}$ is equivalent to $\frac{4}{y^2}$.

11. Given that the remainder when $f(x) = 2x^3 + 6x^2 + 5x + 8$ is divided by $x + 3$ is -7. What is the value of $f(-3)$?

12. Given i is the imaginary unit, $(3 - xi)^2$ in simplest form is what?

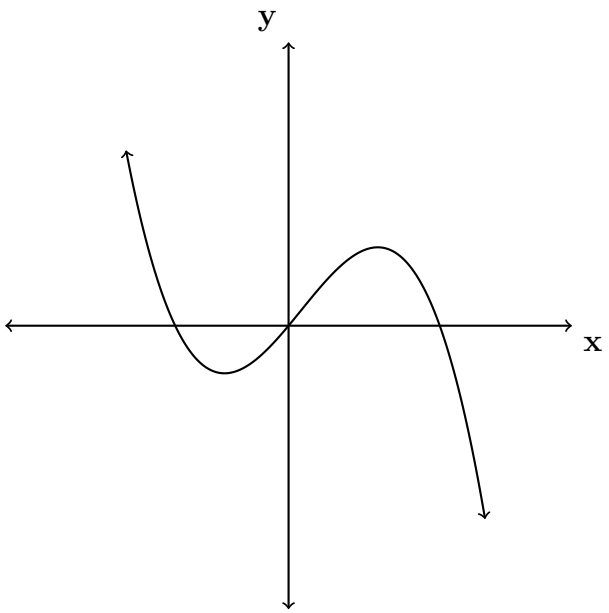
Take home test: Functions, exponents, & imaginary numbers

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 $\dfrac{5x^3 + 35x^2 - 10x}{5x}$, where $x \neq 0$.

Take home test: Functions, exponents, & imaginary numbers

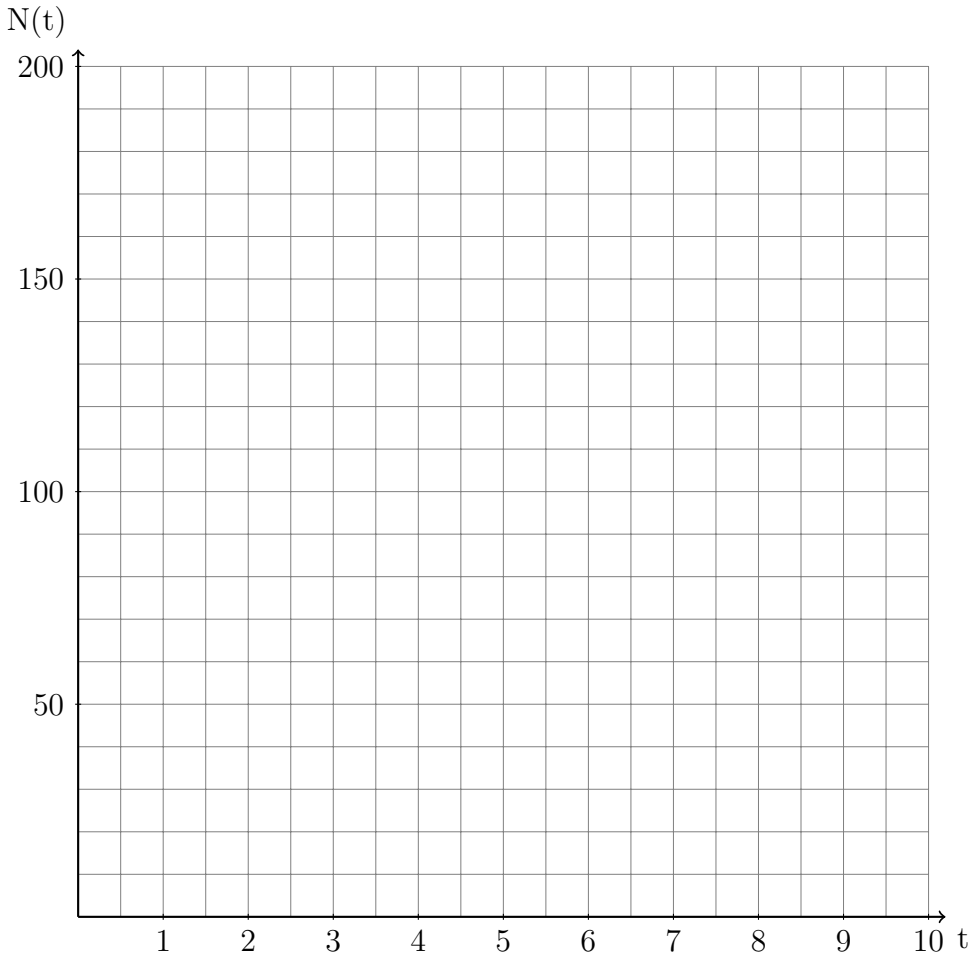
15. Given $N(t) = N_0(e)^{-rt}$, where $N(t)$ is the amount of a drug, N_0 is the initial dosage, r is the decay rate, and t is time in hours.

    For A, model $A(t)$ as an initial amount of 190 milligrams and decay rate of 0.20.

    For $B, B(t)$ is 65 milligrams initially with a decay rate of 0.07.

    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*?

Take home test: Functions, exponents, & imaginary numbers

16. A suburban high school has a population of 1376 students. The number of students who participate in sports is 649. The number of students who participate in music is 433. If the probability that a student participates in either sports or music is $\frac{974}{1376}$, what is the probability that a student participates in both sports and music?

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

18. Sean's team has a baseball game tomorrow. He pitches 50% of the games. There is a 40% chance of rain during the game tomorrow. If the probability that it rains given that Sean pitches is 40%, it can be concluded that these two events are

    (a) independent

    (b) dependent

    (c) mutually exclusive

    (d) complements