

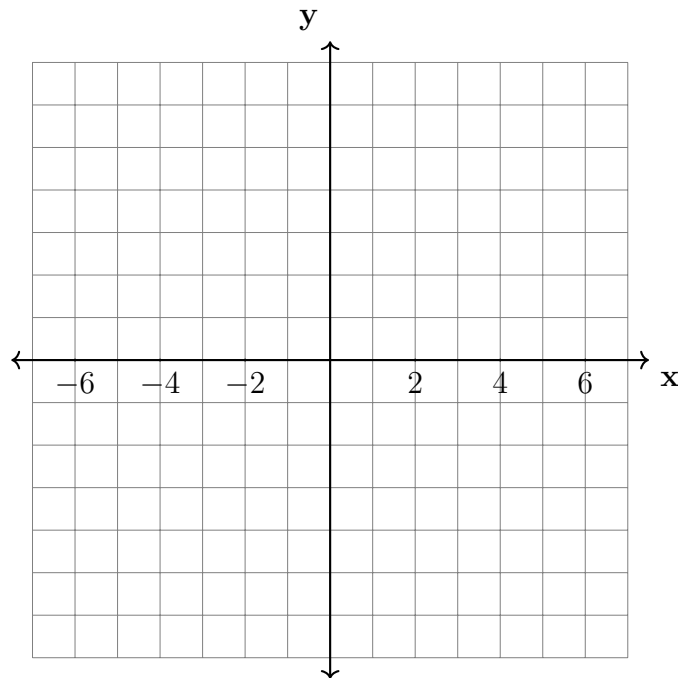
24 May 2018

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.

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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)

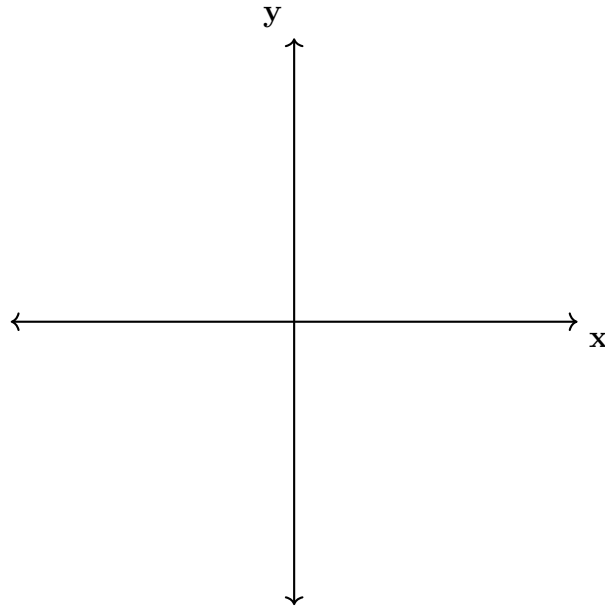
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7. Sketch a graph of a cubic polynomial with the following characteristics:

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

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

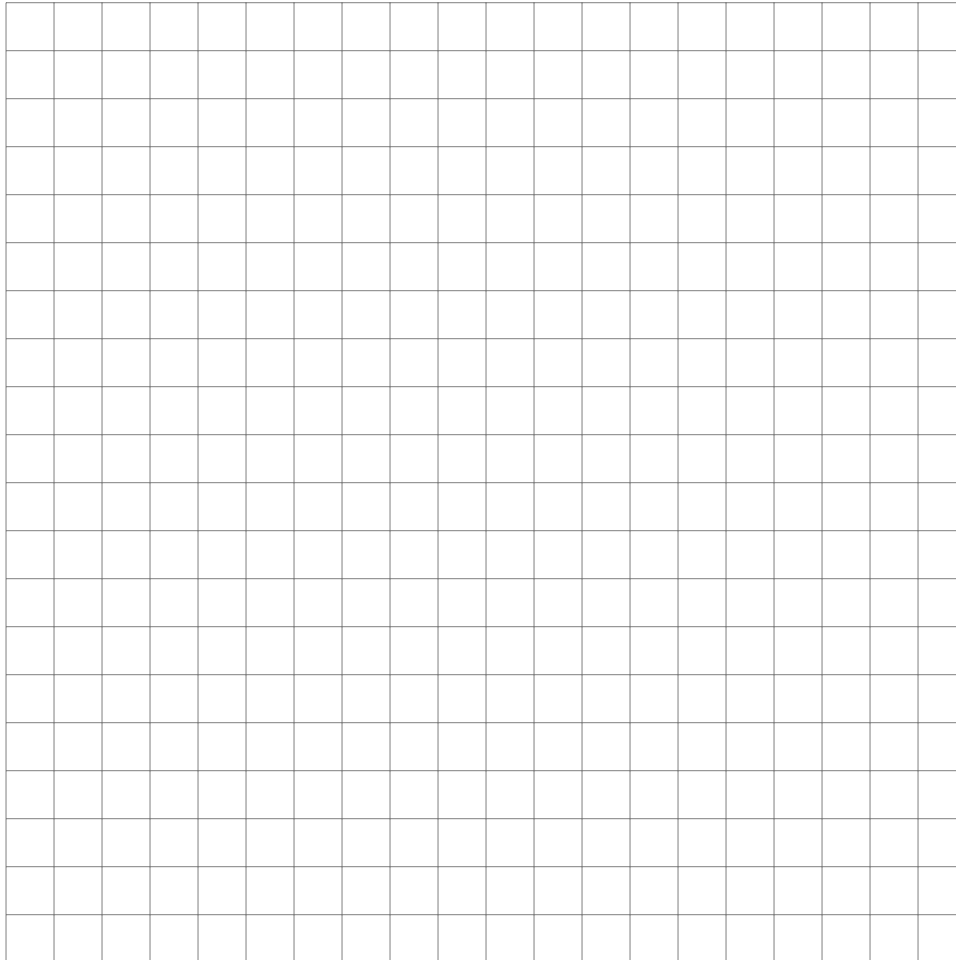
$$x^3 + 3x^2 + 5x + 3 = (x + 1)(x^2 + hx + k)$$

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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.

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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?

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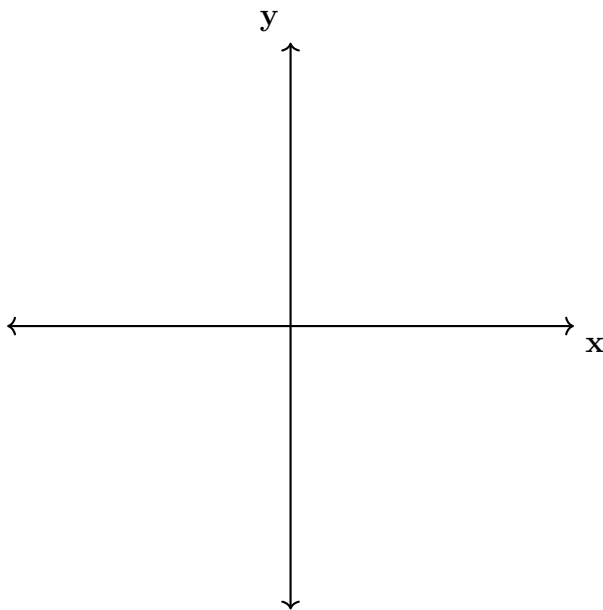
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13. For the polynomial with graph shown, state

(a) its degree

(b) how many distinct zeros it has

(c) the sign of its leading coefficient

14. Simplify the expression $\frac{5x^3 + 35x^2 - 10x}{5x}$, where $x \neq 0$.

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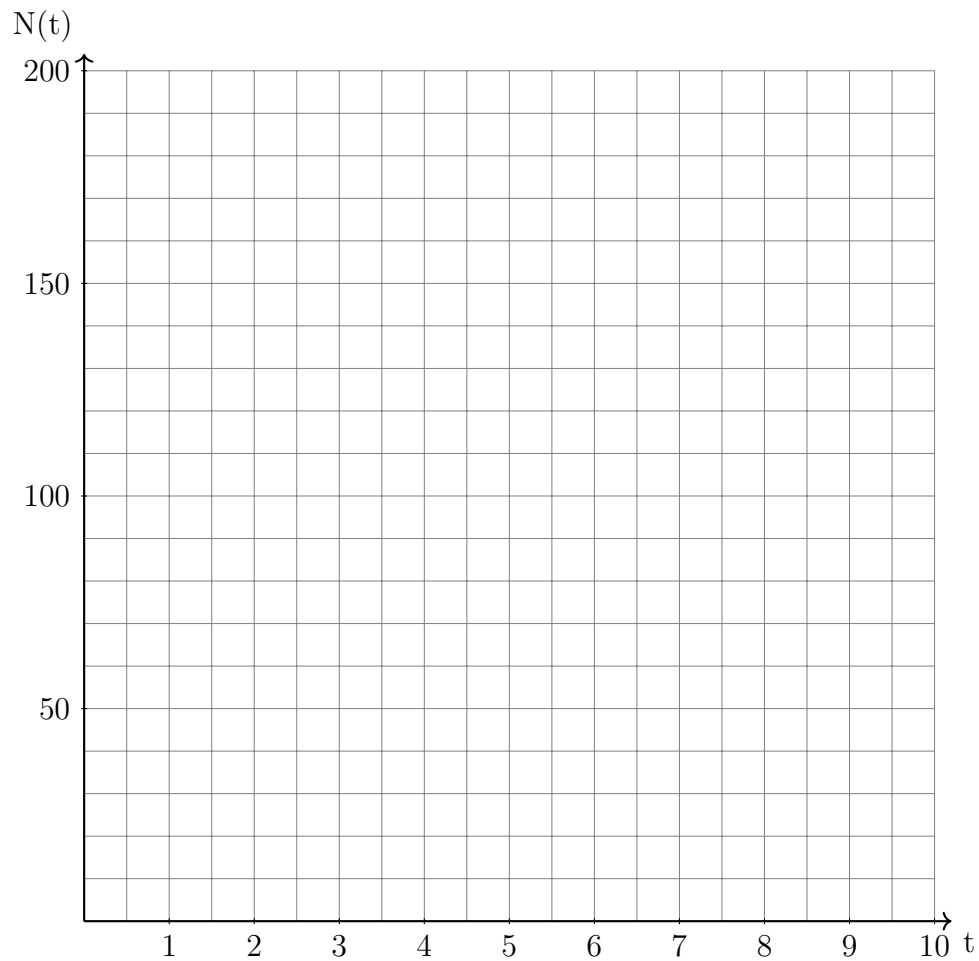
15. Given $N(t) = N_0(e)^{-rt}$, where $N(t)$ is the amount of a drug, N_0 is the initial dosage, r is the decay rate, and t is time in hours.

For A , model $A(t)$ as an initial amount of 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*?

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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

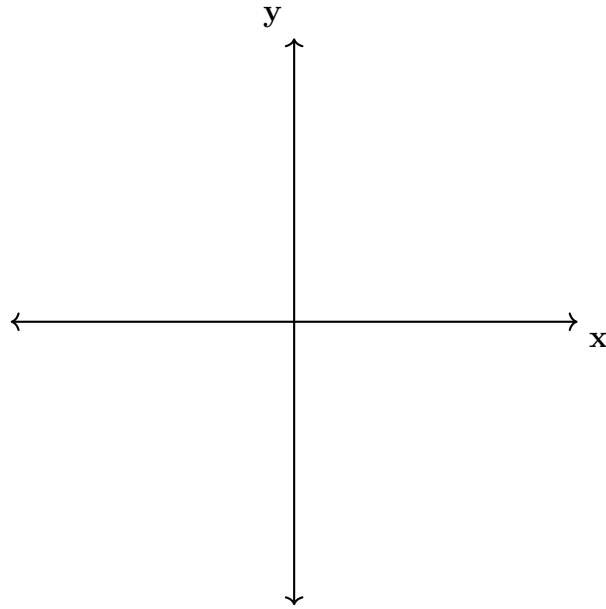
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19. Sketch a graph with the following characteristics:

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



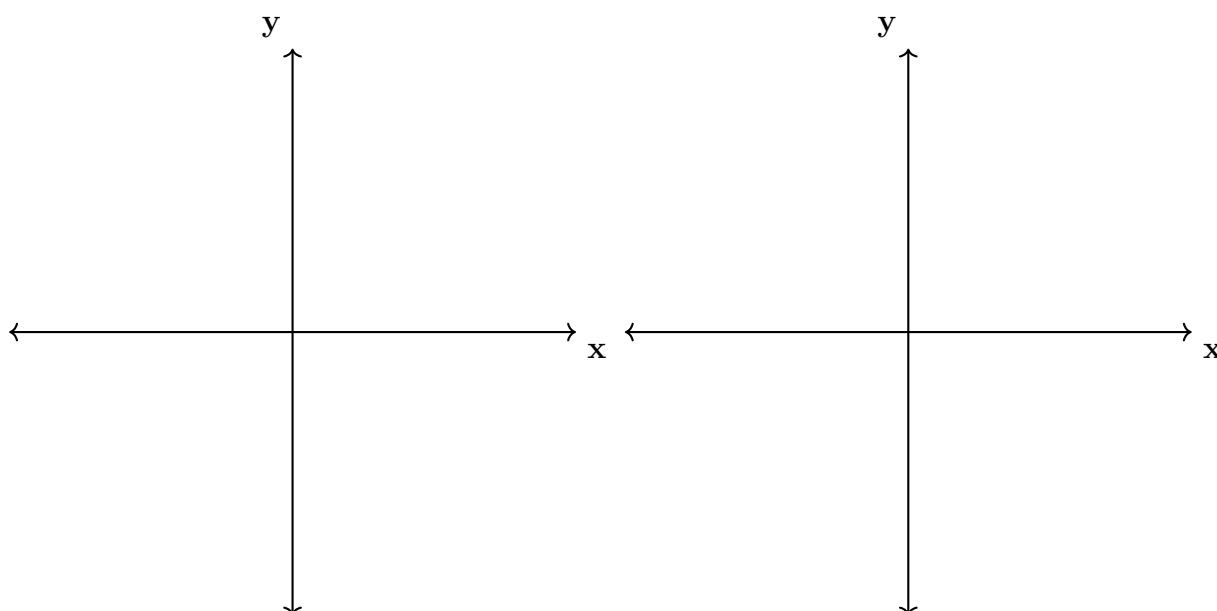
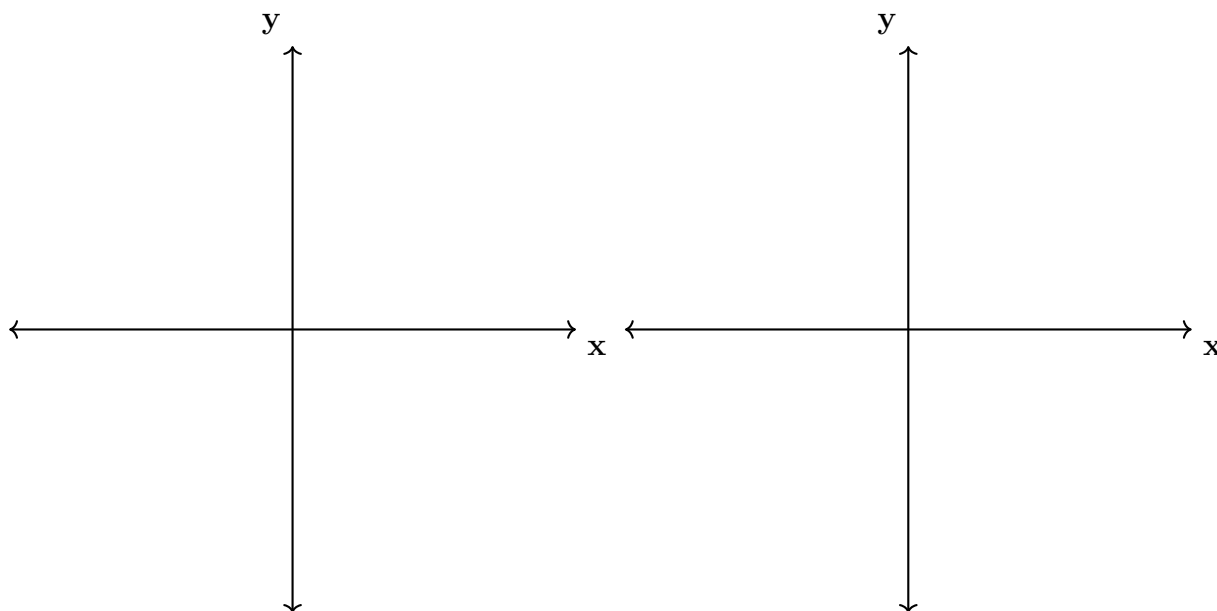
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20. For each polynomial graph, state

- (a) its degree,
- (b) how many distinct zeros it has, and
- (c) the sign of its leading coefficient.



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21. What is the expression $6xi^3(-4xi + 5)$ is equivalent to?
22. Simplify the expression $(3k - 2i)^2$, where i is the imaginary unit.