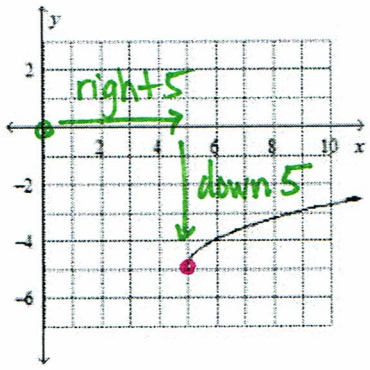
Name: Key

Math 2 NCFE Practice: Transformations, Graphs, and Probability

A 1. The graph of $y = x^2$ is shifted up 3 units and right 5 units. Which equation represents the resulting graph?

(A.) $y = (x-5)^2 + 3$
B. $y = (x+5)^2 + 3$
C. $y = (x-3)^2 + 5$
D. $y = (x+3)^2 + 5$

B 2. Which function matches the graph?



A. $y = \sqrt{x+5} + 5$
C. $y = \sqrt{x+5} - 5$
(B.) $y = \sqrt{x-5} - 5$
D. $y = \sqrt{x-5} + 5$

B 3. Which of the following algebraic rules describes an *isometric* transformation?

~~I. $(x, y) \rightarrow (3x, 3y - 1)$~~
II. $(x, y) \rightarrow (-x - 6, -y + \frac{1}{4})$
III. $(x, y) \rightarrow (-y, x + 1)$

pre-image and image are congruent
not true for a dilation

A. I and II
(B.) II and III
C. I and III
D. None on the above

B 4. Convert the equation, $y = x^2 + 4x + 13$ to vertex form.

A. $y = (x+2)^2$
(B.) $y = (x+2)^2 + 9$
C. $y = (x+4) - 3$
D. $y = (x+4)^2$

complete the square:

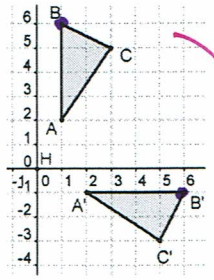
$x^2+4x+13$
$\div 2$ $= \frac{4}{2}$
$(x+2)^2 + 9$

D 5. Which of the following is true for a quadratic function with an imaginary root?

no real roots

A. A quadratic has an imaginary solution if is it not factorable.
B. A quadratic has an imaginary root if the parabola is upside down.
C. A quadratic has an imaginary root if the parabola "bounces" off of the x-axis.
(D.) A quadratic has an imaginary root if the parabola does not touch the x-axis.

D 6. Which of the following correctly describes the transformation of triangle ABC?



rotation 90° CW

example:
B(1,6)
B'(6,-1)
how did B change?

A. $(x,y) \rightarrow (x, -y)$

B. $(x,y) \rightarrow (y,x)$

C. $(x,y) \rightarrow (-x,y)$

(D.) $(x,y) \rightarrow (y,-x)$

D 7. Which equation correctly models the graph shown?

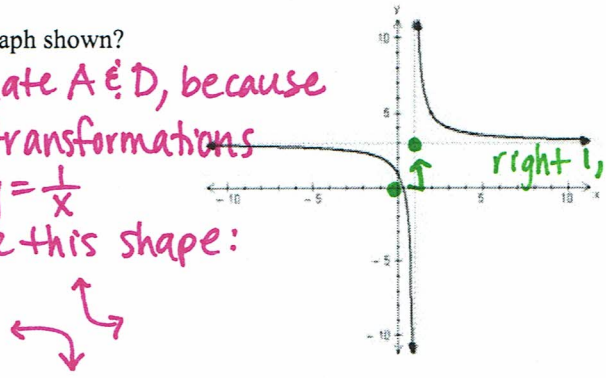
A. $y = \sqrt{x-1} + 3$

B. $y = \frac{1}{x-3} + 1$

C. $y = (x-1)^2 + 3$

(D.) $y = \frac{1}{x-1} + 3$

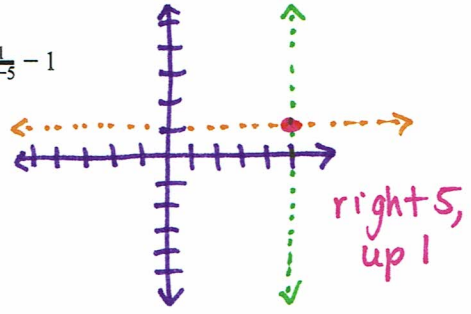
Eliminate A & D, because only transformations of $y = \frac{1}{x}$ make this shape:



right 1, up 3

B 8. Which of the following functions has asymptotes at $x = 5$ and $y = 1$?

A. $y = -\frac{1}{x+5} + 1$ (B.) $y = -\frac{1}{x-5} + 1$ C. $y = \frac{1}{x+5} + 1$ D. $y = \frac{1}{x-5} - 1$

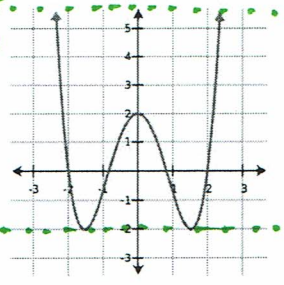


right 5, up 1

B 9. What is the range of the graph on the right?

y-values

highest y: ∞ (arrows)



lowest y: -2

A. $-\infty \le y \le \infty$

(B.) $-2 \le y \le \infty$

C. $-2 \le y \le 2$

D. $-2.5 \le y \le 2.5$

C 10. Twenty-one students at a school have an allergy to peanuts, shellfish, or both.

- Fourteen students at the school are allergic to peanuts.
- Twelve students at the school are allergic to shellfish.

How many of the students are allergic to both peanuts and shellfish?

A. 12
B. 7
(C.) 5
D. 2

14 + 12 = 26

... but there were only 21 students.

So 5 students were counted twice.

C 11. Suppose that James can choose to get home from work by taxi or bus.

- When he chooses to get home by taxi, he arrives home after 6 p.m. 8 percent of the time.
- When he chooses to get home by bus, he arrives home after 6 p.m. 15 percent of the time.
- Because the bus is cheaper, he uses the bus 60 percent of the time.

What is the ***approximate*** probability that James chose to get home from work by bus, given that he arrived home after 6 p.m.?

A. 0.09
B. 0.14
C. 0.60
D. 0.74

	Taxi	Bus	Total
Before 6	32%	45%	77%
After 6	8%	15%	23%
Total	40%	60%	100%

$P(\text{bus} \mid \text{after 6 p.m.}) = \frac{15\%}{23\%}$

$= 65\%$

C 12. For a carnival game, a jar contains 20 blue marbles and 80 red marbles.

- Children take turns randomly selecting a marble from the jar.
- If the blue marble is chosen, the child wins a prize.
- After each turn, the marble is replaced.
- Casey has drawn six red marbles in a row.

Which statement is true?

A. If Casey selects another red marble, then 2 of her next 3 picks will be blue marbles because 2 blue marbles are selected for every 8 red marbles selected.

B. The probability that Casey selects a blue marble on the next turn is higher than it was on her last turn because she has chosen so many red marbles in a row.

C. The probability that Casey selects a blue marble on her next turn is the same as it was on the last turn because selections are independent of each other.

D. If Casey draws 4 more times, she will select 2 blue marbles because the probability that a blue marble will be selected is 2 out of every 10 turns.

free response:

13. The function $f(x)$ is defined as $f(x) = x^2 + 2x - 4$. The function $g(x)$ is defined as $g(x) = -3f(x) + 2$.

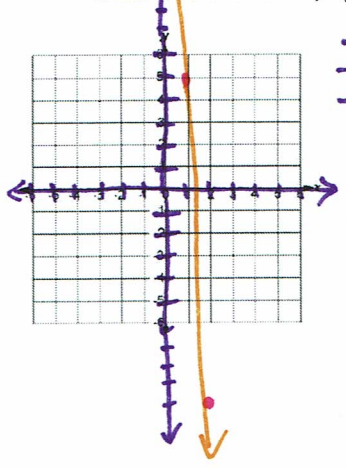
- Graph $g(x)$ for $-2 \le x \le 2$.
- Describe the transformations that take the function $f(x)$ onto $g(x)$.
- Write a new function, $h(x)$, that transforms $g(x)$ back onto $f(x)$.

$-3(x^2+2x-4)+2$

$-3x^2-6x+12+2$

$g(x) = -3x^2-6x+14$

a)

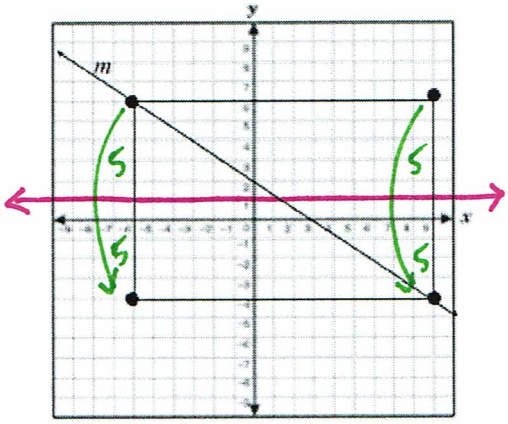


x	y
-2	14
-1	17
0	14
1	5
2	-10

b) Transformations from f(x) onto g(x):
Since $g(x) = -3f(x) + 2$, you take f(x) and reflect over the x-axis, dilate by a vertical stretch by a factor of 3, and translate up 2.

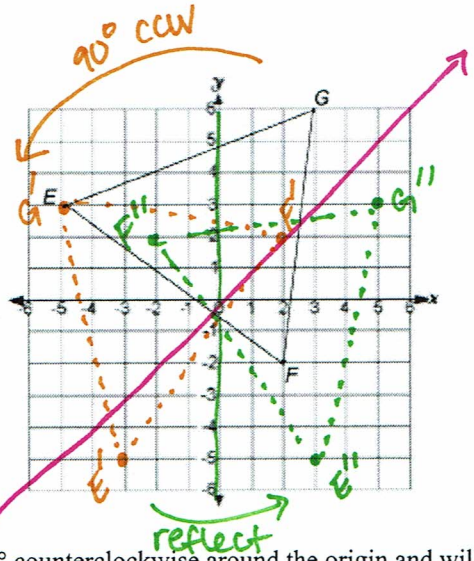
c) $h(x) = -\frac{1}{3}(g(x) - 2)$. ← The reverse set of transformations.

B 14. Which transformation will carry the rectangle shown below onto itself?



A. a reflection over line m
B. a reflection over line $y = 1$
C. a rotation 90° counterclockwise about the origin
D. a rotation 270° counterclockwise about the origin

D 15. Triangle EGF is graphed below.



Triangle EGF will be rotated 90° counterclockwise around the origin and will then be reflected across the y-axis, producing an image triangle. Which additional transformation will map the image triangle back onto the original triangle?

A. rotation 270° counterclockwise around the origin
B. rotation 180° counterclockwise around the origin
C. reflection across the line $y = -x$
D. reflection across the line $y = x$