Quadratics: Final Exam Prep

Name: Key!

Math II

Directions: The following questions are sample items similar to those found on the EOC Exam. Answer each to the best of your ability.

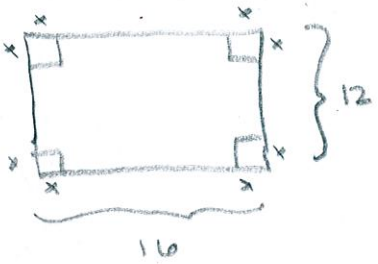
1. Congruent squares, with side lengths of x, are cut from the corners of a 12-inch-by-16-inch piece of cardboard to form an open box. Which equation models the surface area, y, of the open box after the corners are cut away?

   A $y = (16 - 2x)(12 - 2x)$

   B $y = (16 - 2x)(12 - 2x) + 4x^2$

   C $y = 192 - 16x^2$

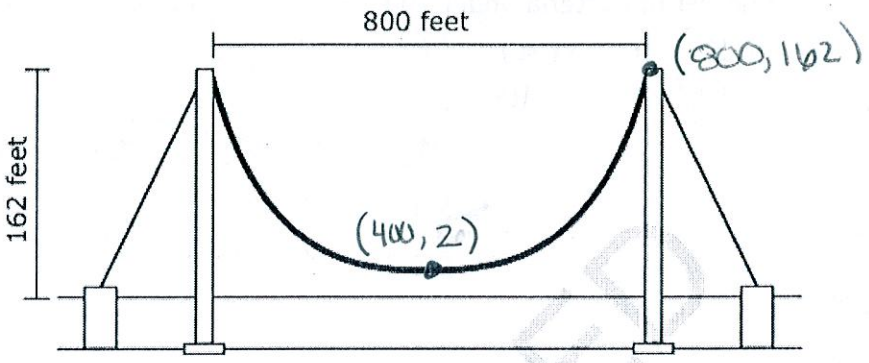
   (D) $y = 192 - 4x^2$



$A = (16)(12) - 4x^2$

$A = 192 - 4x^2$

2. The towers of a suspension bridge are 800 feet apart and rise 162 feet higher than the road. Suppose that the cable between the towers has the shape of a parabola and is 2 feet higher than the road at the point halfway between the towers.



What is the ***approximate*** height of the cable 120 feet from either tower?

(A) 80 feet

B 74 feet

C 22 feet

D 16 feet

$y = a(x-h)^2 + k$

$y = a(x-400)^2 + 2$

$162 = a(800-400)^2 + 2$

$160 = 160000a$

$a = 0.01$

$y = 0.01(x-400)^2 + 2$

$y = 0.01(120-400)^2 + 2$

$y = 80.4$

3. A system of equations is shown below.

$y = x^2 + 2x + 8$

$y = -4x$

What is the smallest value of y in the solution set of the system?

A -4

B -2

(C) 8

D 16

$y = -4(-4) = 16$

$y = -4(-2) = 8$

{or graph & find the intersections}

$-4x = x^2 + 2x + 8$

$0 = x^2 + 6x + 8$

$0 = (x+4)(x+2)$

$x+4 = 0 \quad x+2 = 0$

$x = -4 \quad x = -2$

$y = -4x$

4. If t is an unknown constant, which binomial must be a factor of $7m^2 + 14m - tm - 2t$?

A $7m + t$

B $m - t$

(C) $m + 2$

D $m - 2$

$(7m^2 + 14m)(-tm - 2t)$

$7m(m+2) - t(m+2)$

$(7m - t)(m+2)$

5. The graph of $f(x) = x^2$ will be translated 5 units up and 2 units to the right. Which function describes the graph produced by the translation?

(A) $g(x) = x^2 - 4x + 9$

B $g(x) = x^2 + 4x - 1$

C $g(x) = x^2 - 10x + 27$

D $g(x) = x^2 + 10x + 23$

$y = (x-2)^2 + 5$

$y = (x-2)(x-2) + 5$

$y = (x^2 - 4x + 4) + 5$

$y = x^2 - 4x + 9$

6. The number of bacteria in a culture can be modeled by the function $N(t) = 28t^2 - 30t + 160$, where t is the temperature, in degrees Celsius, the culture is being kept. A scientist wants to have fewer than 200 bacteria in a culture in order to test a medicine effectively. What is the ***approximate*** domain of temperatures that will keep the number of bacteria under 200?

A $-1.01°C < t < 2.03°C$

B $-0.90°C < t < 1.97°C$

C $-0.86°C < t < 1.93°C$

(D) $-0.77°C < t < 1.85°C$

$28t^2 - 30t + 160 = 200$

$\frac{28t^2 - 30t - 40}{2} = \frac{0}{2}$

$14t^2 - 15t - 20 = 0$

$a = 14 \quad b = -15 \quad c = -20$

$x = \frac{15 \pm \sqrt{(15)^2 - 4(14)(-20)}}{2(14)}$

$x = \frac{15 \pm \sqrt{1345}}{28} = \frac{15 \pm 36.67}{28}$

$x = \frac{15 + 36.67}{28} = 1.84$

$x = \frac{15 - 36.67}{28} = -0.77$

7. Which equation has exactly one real solution?

A $4x^2 - 12x - 9 = 0$

(B) $4x^2 + 12x + 9 = 0$

C $4x^2 - 6x - 9 = 0$

D $4x^2 + 6x + 9 = 0$

graph, & look where it crosses the x-axis once.

8. The sum of two numbers is 24. The sum of the squares of the two numbers is 306. What is the product of the two numbers?

A 119

B 128

(C) 135

D 144

$x + y = 24 \qquad x^2 + y^2 = 306$

$x^2 = 306 - y^2$

$x = \sqrt{306 - y^2}$

$\sqrt{306 - y^2} + y = 24$

$\left(\sqrt{306 - y^2}\right)^2 = (24 - y)^2$

$306 - y^2 = (24 - y)(24 - y)$

$306 - y^2 = 576 - 48y + y^2$

$-306 + y^2 \quad -306 \quad +y^2$

$2y^2 - 48y + 270 = 0$

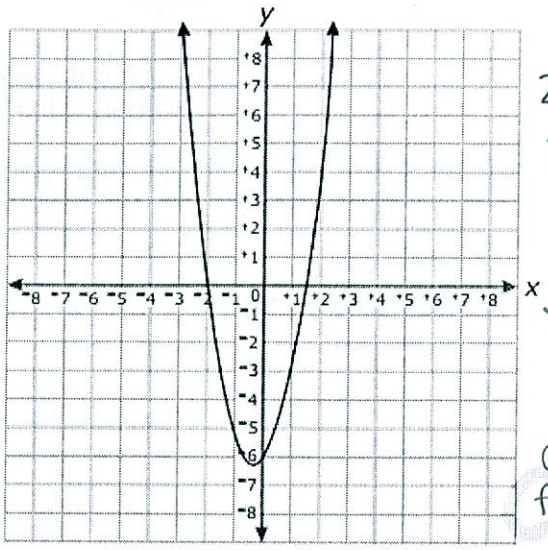
$y^2 - 24y + 135 = 0$

$(y - 9)(y - 24) = 0$

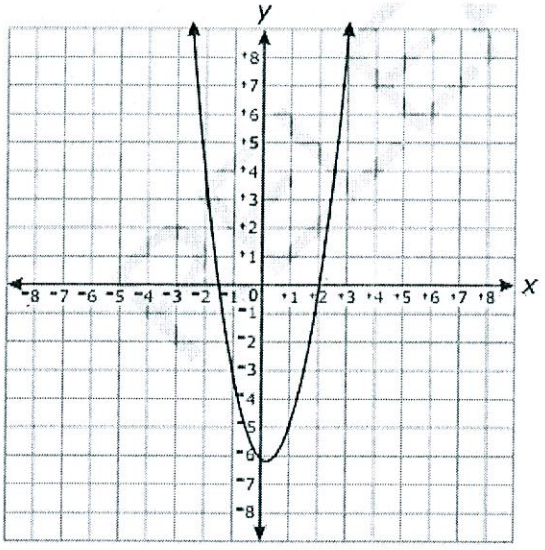
$y = 9 \quad y = 24$

9. Which graph displays the function $f(x)=(2x + 3)(x - 2)$?

A



B



$2x+3=0$

$2x=-3$

$x=-3/2$

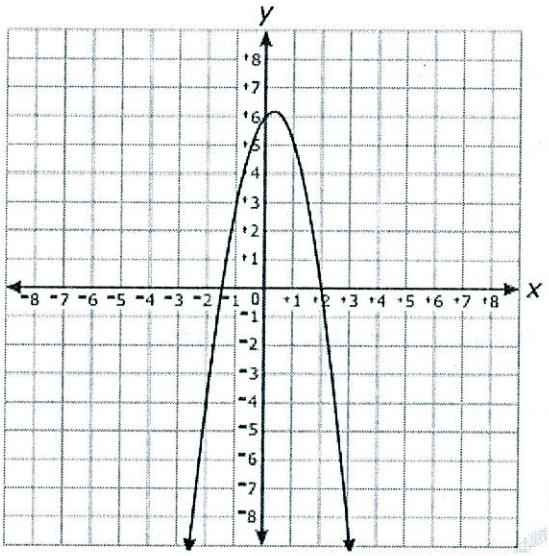
$x-2=0$

$x=2$

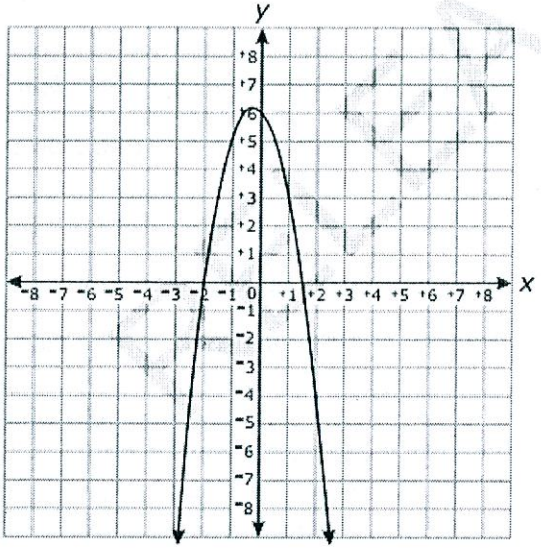
$a=1$

faces up

C



D



10. A rectangular rug is placed on a rectangular floor. The width of the floor is 4 feet greater than the length, x, of the floor. The width of the rug is 2 feet less than the width of the floor. The length of the rug is 4 feet less than the width of the rug. Which function, $R(x)$, represents the area of the floor ***not*** covered by the rug?

A $R(x) = x^2 - x + 4$

B $R(x) = 2x^2 + 4x - 4$

C $R(x) = 12x - 4$

(D) $R(x) = 4x + 4$

Floor

$L = x$

$W = x+4$

Rug

W = width of floor $-2 = x+2$

L = width of rug $-4 = x-2$

$A_{shaded} = A_{Floor} - A_{rug}$

$A_{Floor} = x(x+4)$

$= x^2+4x$

$A_{rug} = (w+2)(w-2)$

$= w^2-4$

A_{shaded}:

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

x^2+4x-x^2+4

$4x+4$

11. The heights of two different projectiles after they are launched are modeled by $f(x)$ and $g(x)$. The function $f(x)$ is defined as $f(x) = -16x^2 + 42x + 12$. The table contains the values for the quadratic function g.

x	$g(x)$
0	9
1	33
2	25

put in Stat Edit
Stat → calc → 5
$y = -16x^2 + 40x + 9$

What is the ***approximate*** difference in the maximum heights achieved by the two projectiles?

f(x) max = 39.56
g(x) max = 34
5.56

A 0.2 feet

B 3.0 feet

C 5.4 feet

(D) 5.6 feet

12. Farmer Brown built a rectangular pen for his chickens using 12 meters of fence.

- He used part of one side of his barn as one length of the rectangular pen.
- He maximized the area using the 12 meters of fence.

Farmer Johnson built a rectangular pen for her chickens using 16 meters of fence.

- She used part of one side of her barn as one length of the rectangular pen.
- The length of her pen was 2 meters more than the length of Farmer Brown's pen.
- The width of her pen was 1 meter more than the width of Farmer Brown's pen.

How much larger is Farmer Johnson's rectangular pen than Farmer Brown's?

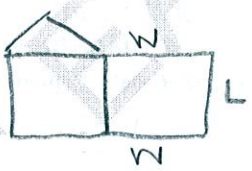
A 24 square meters

B 18 square meters

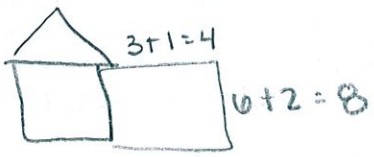
C 16 square meters

(D) 14 square meters

Brown



Johnson



Brown
Max Area = 18
Width = 3
Length = 6

$P = 2w + L$
$12 = 2w + L$
$L = 12 - 2w$
$A = LW$
$A = w(12 - 2w)$
put in calc, find max.

$A = (4)(8) = 32$

32
- 18
14