Quadratic Functions: EOC Prep

Name: Key

Spring 2013

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

1. The function $f(t) = -5t^2 + 20t + 60$ models the approximate height of an object t seconds after it is launched. How many seconds does it take the object to hit the ground? = solution = x-int. = root = zero

$-5t^2+20t+60=0$

$-5(t^2-4t-12)=0$

$-5(t-6)(t+2)=0$

$t-6=0$ → $t=6$

$t+2=0$ → $t=-2$ ↑ time can't be negative

2. What is the smallest of 3 consecutive positive integers if the product of the smaller two integers is 5 less than 5 times the largest integer? ×

1st: x

2nd: $x+1$

3rd: $x+2$

1st × 2nd = 5 × 3rd − 5

$(x)(x+1) = 5(x+2)-5$

$x^2+x = 5x+10-5$

$x^2+x = 5x+5$

$x^2-4x-5=0$

$(x-5)(x+1)=0$

$x-5=0$ → $x=5$

$x+1=0$ → $x=-1$ ↑ Answer must be positive

3. The larger leg of a right triangle is 3 cm longer than its smaller leg. The hypotenuse is 6 cm longer than the smaller leg. How many centimeters long is the smaller leg?

$a^2+b^2=c^2$

Small: x

Large: $x+3$

Hypot: $x+6$

$x^2+(x+3)^2=(x+6)^2$

$x^2+(x+3)(x+3)=(x+6)(x+6)$

$x^2+x^2+6x+9=x^2+12x+36$

$2x^2+6x+9=x^2+12x+36$

$-x^2-12x-36 \quad -x^2-12x-36$

$x^2-6x-27=0$

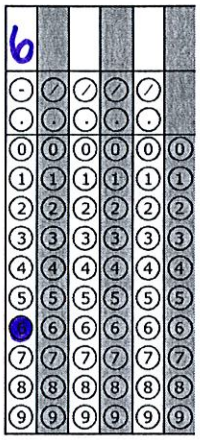
$(x-9)(x+3)=0$

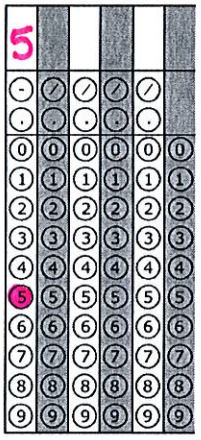
$x-9=0$ → $x=9$

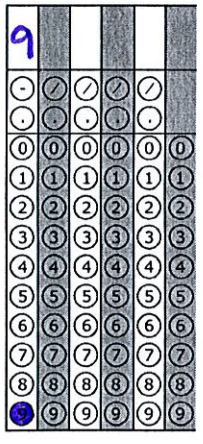
$x+3=0$ → $x=-3$ ↑ Length can't be negative

4. Which term is a factor of $3a^2 + 12a$?

- ✓ A. $3a$ — $3a(a+4)$
- o B. $4a$
- o C. $3a^2$
- o D. $4a^2$







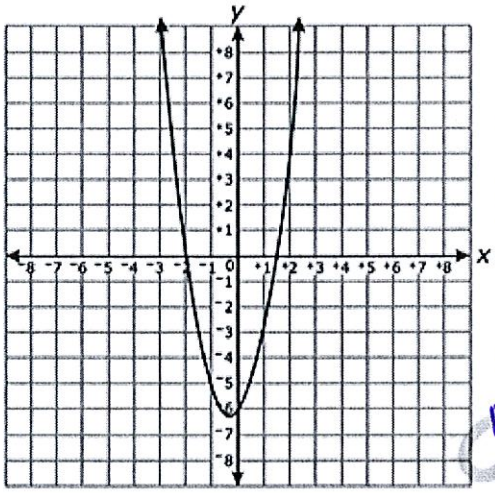
$2x+3=0$ $\quad x-2=0$

$2x=-3$ $\quad x=2$

$x=-3/2$

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

A



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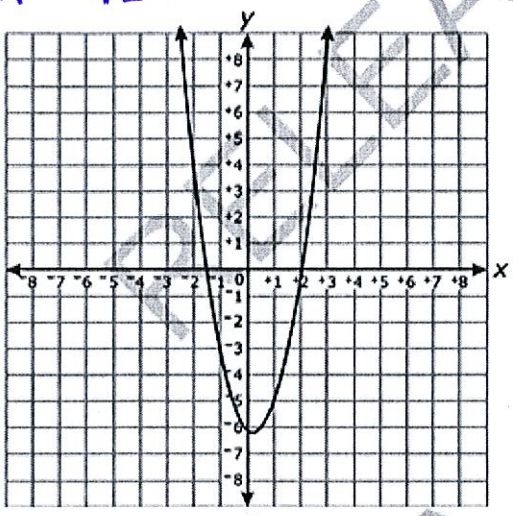


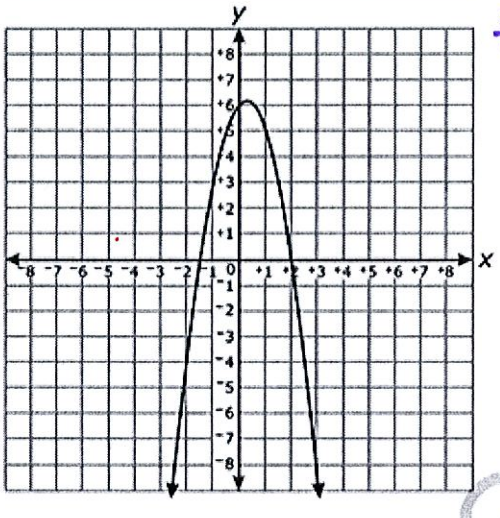
Roots:

$x=-1.5$

$x=2$

"a" is positive so graph is facing up

C



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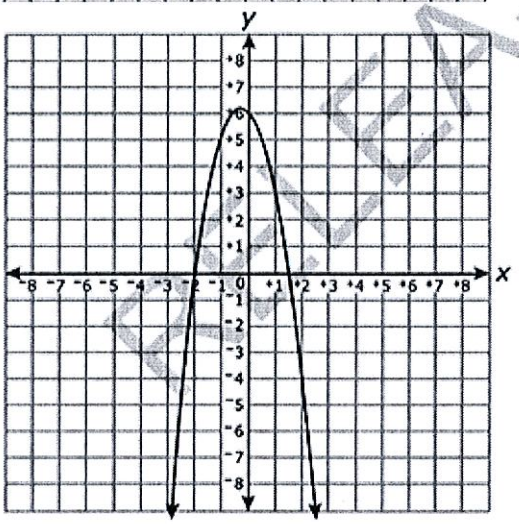


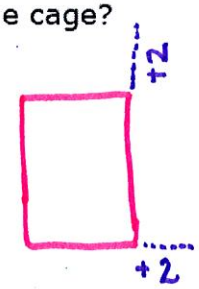
6. The floor of a rectangular cage has a length 4 feet greater than its width, w. James will increase both dimensions of the floor by 2 feet. Which equation represents the new area, N, of the floor of the cage?

A $N = w^2 + 4w$

B $N = w^2 + 6w$

C $N = w^2 + 6w + 8$

D $N = w^2 + 8w + 12$



Length: $w+4+2 = w+6$

Width: $w+2$

$A = \text{Length} \times \text{width}$

$A=(w+6)(w+2)$

$A = w^2+8w+12$

7. Which expression is equivalent to $t^2 - 36$?

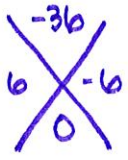
A $(t-6)(t-6)$

B $(t+6)(t-6)$

C $(t-12)(t-3)$

D $(t-12)(t+3)$

$t^2+0t-36$

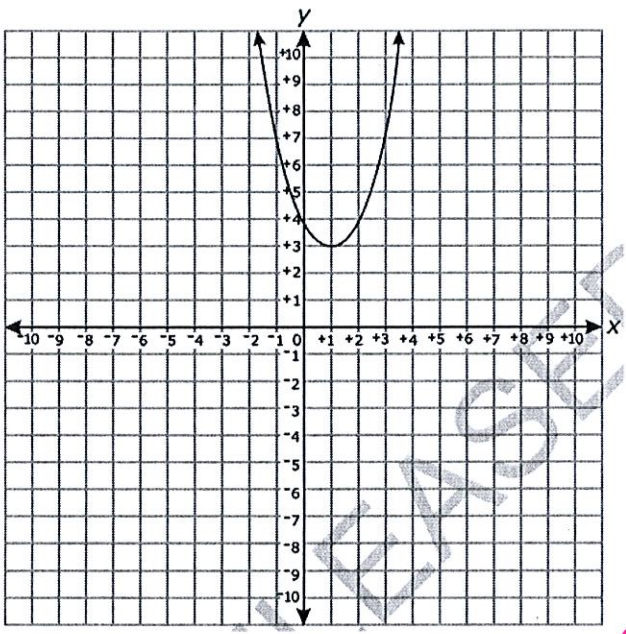


$(t+6)(t-6)$

8. Which is the graph of the function $f(x) = 4x^2 - 8x + 7$?

↳ y-intercept

A



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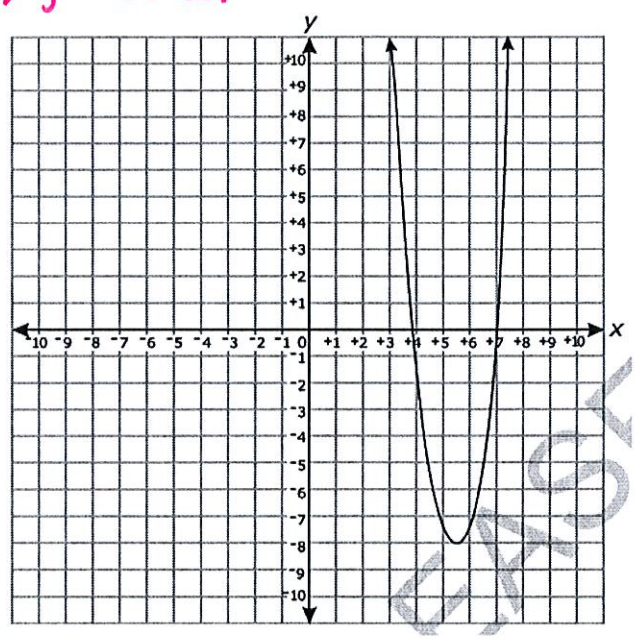

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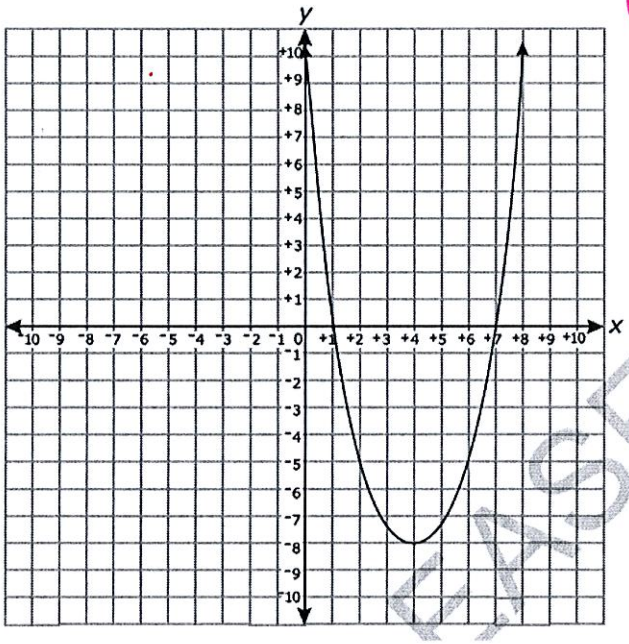

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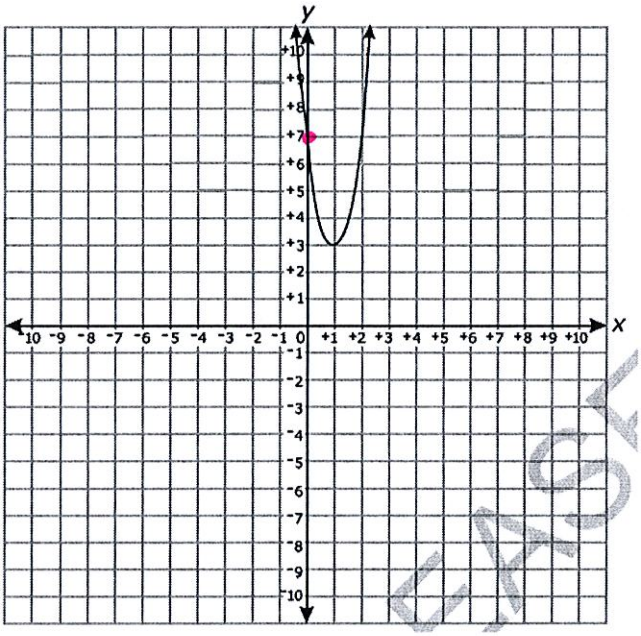

9. Suppose that the equation $V = 20.8x^2 - 458.3x + 3{,}500$ represents the value of a car from 1964 to 2002. What year did the car have the least value? ($x = 0$ in 1964)

↳ minimum = axis of symmetry

A 1965

B 1970

C 1975

D 1980

$x = \frac{-b}{2a} = \frac{-(-458.3)}{2(20.8)}$

$= \frac{458.3}{41.6} = 11$ years

1964 + 11 = 1975

10. 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) $-0.77°C < t < 1.85°C$

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

$28t^2 - 30t - 40 = 0$

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

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

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

$x = \frac{15 \pm 36.7}{28}$

$x = \frac{15 + 36.7}{28} = 1.8$

$x = \frac{15 - 36.7}{28}$

$x = -0.775$

11. 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, then look to see which one only crosses the x-axis once!

12. 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

$x + y = 24$

$x^2 + y^2 = 306$

$y = 24 - x$

$x^2 + (24 - x)^2 = 306$

$x^2 + (24 - x)(24 - x) = 306$

$x^2 + 576 + 48x + x^2 = 306$

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

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

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

$(x - 15)(x - 9) = 0$

$x - 15 = 0 \quad x - 9 = 0$

$x = 15 \quad x = 9$

$15 \times 9 = 135$

13. 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.

$g(x) = -16x^2 + 40x + 9$

put table into STAT

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

f(x) max: 39.6 feet

g(x) max: 34

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

A 0.2 feet

B 3.0 feet

C 5.4 feet

(D) 5.6 feet

$39.6 - 34.0 = 5.6$ feet

14. Which expression is equivalent to $-3x(x - 4) - 2x(x + 3)$?

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

$-5x^2+6$

(1) $-x^2 - 1$
(3) $-5x^2 - 6x$
(2) $-x^2 + 18x$
(4) $-5x^2 + 6x$

15. The length of a rectangle is 3 inches more than its width. The area of the rectangle is 40 square inches. What is the length, in inches, of the rectangle?

Length : $w+3$
Width : w
Area : lw

$(w+3)(w) = 40$
$w^2+3w = 40$
$w^2+3w-40=0$
$(w+8)(w-5)=0$
$w+8=0$ $\quad w-5=0$
$w=-8$ $\quad w=5$
↑ can't be negative

(1) 5
(3) 8.5
(2) 8
(4) 11.5

16. Which expression represents $36x^2 - 100y^6$ factored completely?

$4(9x^2-25y^6)$
$4(3x-5y^3)(3x+5y^3)$

(1) $2(9x + 25y^3)(9x - 25y^3)$
(2) $4(3x + 5y^3)(3x - 5y^3)$
(3) $(6x + 10y^3)(6x - 10y^3)$
(4) $(18x + 50y^3)(18x - 50y^3)$

17. What are the roots of the equation $x^2 - 5x + 6 = 0$?

$(x-2)(x-3)=0$
$x-2=0$ $\quad x-3=0$
$x=2$ $\quad x=3$

(1) 1 and -6
(3) -1 and 6
(2) 2 and 3
(4) -2 and -3

18. Which expression is equivalent to $64 - x^2$?

Difference of squares
$x^2-y^2 = (x-y)(x+y)$

(1) $(8 - x)(8 - x)$
(3) $(x - 8)(x - 8)$
(2) $(8 - x)(8 + x)$
(4) $(x - 8)(x + 8)$

19. The equation of the axis of symmetry of the graph of $y = 2x^2 - 3x + 7$ is

$x = \frac{-b}{2a} = \frac{-(-3)}{2(2)} = \frac{3}{4}$

(1) $x = \frac{3}{4}$
(3) $x = \frac{3}{2}$
(2) $y = \frac{3}{4}$
(4) $y = \frac{3}{2}$

20. The roots of the equation $3x^2 - 27x = 0$ are

$3x(x-9)=0$
$3x=0$ $\quad x-9=0$
$x=0$ $\quad x=9$

(1) 0 and 9
(3) 0 and 3
(2) 0 and -9
(4) 0 and -3