

# FREE RESPONSE

① A rectangular rug has a length of  $f(x) = 3x - 5$  and a width of  $g(x) = x - 4$ .

a) If the area is 30, find  $x$ .



$$A = l \cdot w$$

$$30 = (3x-5)(x-4)$$

$$30 = 3x^2 - 12x - 5x + 20$$

$$30 = 3x^2 - 17x + 20$$

-30

-30

$$0 = 3x^2 - 17x - 10$$

$$a=3 \quad b=-17 \quad c=-10$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-17) \pm \sqrt{(-17)^2 - 4(3)(-10)}}{2(3)}$$

$$x = 6.18$$

$$x = -0.51$$

no neg distance

b) If the perimeter is 34, find  $x$ .

$$P = l + l + w + w$$

$$34 = (3x-5) + (3x-5) + (x-4) + (x-4)$$

$$34 = 8x - 18$$

$$+18 \quad +18$$

$$52 = 8x$$

$$8 \quad 8$$

$$6.5 = x$$

② Factor each expression completely.

a)  $3x^2 - 27$   
 $3(x^2 - 9)$

$3(x+3)(x-3)$  difference of squares

b)  $2x^2 + 50$   
 $2(x^2 + 25)$

c)  $\frac{6x^2}{2} - \frac{28x}{2} + \frac{32}{2}$

$3x^2 - 14x + 16$   
 $x^2 - 14x + 48$

$(x+6)(x-8)$

$(x-2)(x-\frac{8}{3})$

$2(x-2)(3x-8)$

\*slide, divide, bottoms up

check ✓

$2(x-2)(3x-8)$

$2(3x^2 - 8x - 6x + 16)$

$2(3x^2 - 14x + 16)$

$6x^2 - 28x + 32$  ✓

③ A \$9000 diamond earns 0.03% value per year, compounded annually.

a) Write a function to model the value in  $t$  years.

$$y = a(1 \pm r)^t$$

initial value      100% rate      time

$$D(t) = 9000(1 + 0.03)^t$$
$$\underline{D(t) = 9000(1.03)^t}$$

b) What is the value of the diamond in 12 years?

$$t = 12$$

$$D(12) = 9000(1.03)^{12}$$

$$\boxed{\$12,600}$$

④ An object is thrown upwards  
at  $h(t) = h_0 + v_0 t - 4t^2$

a) Write an equation if the object  
is thrown at a velocity of 7 m/s  
from a height of 5 m.

$$h_0 = 5 \text{ (initial height)}$$

$$v_0 = 7 \text{ (initial velocity)}$$

$$h(t) = 5 + 7t - 4t^2$$

b) When does the object hit the ground?  
( $h=0$ )

$$0 = 5 + 7t - 4t^2$$

$$-4t^2 + 7t + 5 = 0$$

$$a = -4 \quad b = 7 \quad c = 5$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

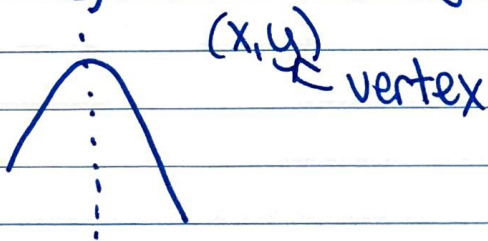
$$x = \frac{-7 \pm \sqrt{(7)^2 - 4(-4)(5)}}{2(-4)}$$

$$x = \cancel{-0.6}$$

(no neg time)

$$x = 2.3$$

c) What is the object's maximum height?



$$x = \frac{-b}{2a} = \frac{-7}{2(-4)} = \frac{-7}{-8} = 0.9$$

$$(0.9, \frac{?}{?})$$

$$5 + 7(0.9) - 4(0.9)^2$$

$$5 + 6.3 - 3.2$$

$$8.1$$

d) What is the domain?

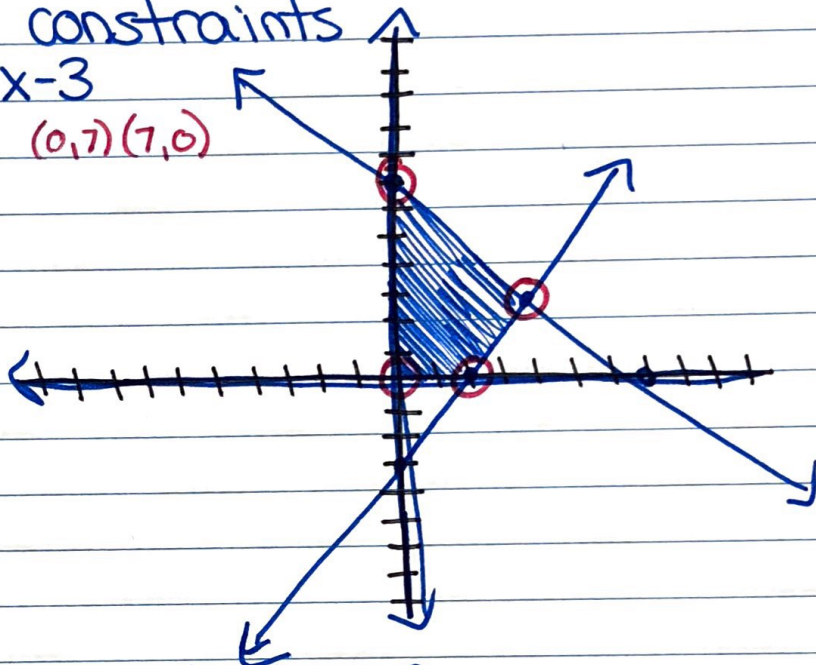
input / x-values

$$0 \leq x \leq 2.3$$

⑤  $P = 3x + 2y$

a) Graph the constraints

$$\begin{cases} y \geq \frac{3}{2}x - 3 \\ x + y \leq 7 \quad (0,7)(7,0) \\ x \geq 0 \\ y \geq 0 \end{cases}$$



b) Determine the coordinates of each vertex.

$(0,0)$   $(0,7)$   $(2,0)$   $(4,3)$

c) Which points give the equation  $P = 3x + 2y$  its maximum value?

$$P = 3x + 2y$$

$$P = 3(0) + 2(0)$$

$$P = 0 + 0$$

$$P = 0$$

$$P = 3x + 2y$$

$$P = 3(0) + 2(7)$$

$$P = 0 + 14$$

$$P = 14$$

$$P = 3x + 2y$$

$$P = 3(2) + 2(0)$$

$$P = 6 + 0$$

$$P = 6$$

$$P = 3x + 2y$$

$$P = 3(4) + 2(3)$$

$$P = 12 + 6$$

$$P = 18$$

$$(4, 3)$$