SOLUTIONS ⇒ QUADRATICS EXAM REVIEW

1

a) 4, 26, 84, 196, 380

D_1: 22, 58, 112, 184

D_2: 36, 54, 72

D_3: 18, 18 — CUBIC

b) (1,5), (2,15), (3,45), (4,135), (5,405)

y-values: 5, 15, 45, 135, 405

×3 ×3 ×3 ×3 EXPONENTIAL

Jun 3-1:38 PM

c) -10, -2, 13, 35, 64, 100

D_1: 8, 15, 22, 29, 36

D_2: 7, 7, 7, 7 — QUADRATIC

d) (0,1000) (1,995.1) (2,980.4) (3,955.9) (4,921.6) (5,877.5)

y-values: 1000, 995.1, 980.4, 955.9, 921.6, 877.5

D_1: -4.9, -14.7, -24.5, -34.3, -44.1

D_2: -9.8, -9.8, -9.8, -9.8

QUADRATIC

Jun 3-1:40 PM

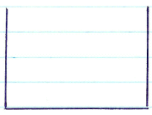
e) -11, 21, 53, 85

D_1: 32, 32, 32 — LINEAR

2. Perimeter = 300m

let x = width

Then 300 − 2x = length



A = length × width

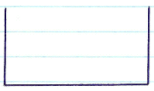
A = (300 − 2x)(x)

OR

A = (300 − 2w)(w)

Jun 3-1:40 PM

3.



P = 688m

let x = width

Then $\frac{688-2x}{2}$ = length

344 − x = length

A = length × width

A = (344 − x)(x)

Jun 3-1:40 PM

4.a) $y = (x+3)^2 - 7$ (SF)

$y = (x+3)(x+3) - 7$

$y = x^2 + 3x + 3x + 9 - 7$

$y = x^2 + 6x + 2$ (GF)

b) $5(y - 1/3) = (x-8)^2$ (TF)

$5(y - 1/3) = (x-8)(x-8)$

$5(y - 1/3) = x^2 - 8x - 8x + 64$

$5(y - 1/3) = x^2 - 16x + 64$

$y - 1/3 = 1/5(x^2 - 16x + 64)$

$y - 1/3 = 1/5x^2 - 16/5x + 64/5$

$y = 1/5x^2 - 16/5x + 64/5 + 1/3$

$y = 1/5x^2 - 16/5x + 192/15 + 5/15$

$y = 1/5x^2 - 16/5x + 197/15$ (GF)

Jun 3-1:40 PM

a) $2(y-5) = (x+7)^2$ (TF)

$2(y-5) = (x+7)(x+7)$

$2(y-5) = x^2 + 7x + 7x + 49$

$2(y-5) = x^2 + 14x + 49$

$y - 5 = 1/2(x^2 + 14x + 49)$

$y - 5 = 1/2x^2 + 14/2x + 49/2$

$y = 1/2x^2 + 7x + 49/2 + 5/1$

$y = 1/2x^2 + 7x + 49/2 + 10/2$

$y = 1/2x^2 + 7x + 59/2$ (GF)

d) $y = 2(x+3)^2 + 7$ (SF)

$y = 2(x+3)(x+3) + 7$

$y = (2x+6)(x+3) + 7$

$y = 2x^2 + 6x + 6x + 18 + 7$

$y = 2x^2 + 12x + 25$ (GF)

Jun 3-1:40 PM

5. a) $\frac{1}{2}y=(x+7)^2$ (TF) b) $3(y-7)=(x-9)^2$ (TF)

$y=2(x+7)^2$ (SF) $y-7=\frac{1}{3}(x-9)^2$

$y=\frac{1}{3}(x-9)^2+7$ (SF)

c) $7(y+8)=(x+2)^2$ (TF)

$y+8=\frac{1}{7}(x+2)^2$

$y=\frac{1}{7}(x+2)^2-8$ (SF)

6. $h=-5t^2+20t$

a) $t=3$

$h=-5(3)^2+20(3)$

$h=-5(9)+60$

$h=-45+60$

$h=15$ m

Jun 3-1:40 PM

b) $h=-5t^2+20t$

② $h=-5(t^2-4t)$

③ $h-20=-5(t^2-4t+4)$

④ $h-20=-5(t-2)^2$

⑤ $h=-5(t-2)^2+20$

Vertex $(2, 20)$ (Time, Height)

The maximum height of the rocket is 20m

It takes 2 seconds to reach the maximum height.

Jun 3-1:41 PM

c) When the rocket hits the ground → $h=0$

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

3 methods to solve this problem.

#1 Factoring

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

$0=-5t(t-4)$

$\frac{-5t}{-5}=\frac{0}{-5}$ or $t-4=0$

$t=0$ $t=4$

It took to rocket 4 seconds to hit the ground.

Jun 3-1:41 PM

#2 Quadratic Formula

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

$a=-5$, $b=20$, $c=0$

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

$x=\frac{-20\pm\sqrt{(20)^2-4(-5)(0)}}{2(-5)}$

$x=\frac{-20\pm\sqrt{400-0}}{-10}$

$x=\frac{-20\pm\sqrt{400}}{-10}$

$x=\frac{-20\pm20}{-10}$

$x=\frac{-20+20}{-10}$ $x=\frac{-20-20}{-10}$

$x=\frac{0}{-10}$ $x=\frac{-40}{-10}$

$x=0$ $x=4$

Jun 3-1:41 PM

#3 Completing the Square

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

② $0=t^2-4t$

③ $4=t^2-4t+4$

④ $4=(t-2)^2$

⑤ $\pm\sqrt{4}=t-2$

⑥ $\pm2=t-2$

$2\pm2=t$

$2+2=t$ OR $2-2=t$

$4=t$ $0=t$

Jun 3-1:41 PM

7. $h=-5t^2+5t+3$

a) The diving board is 3m high.

* The constant term in the equation represents initial height.

b) $h=-5t^2+5t+3$

① $h-3=-5t^2+5t$

② $h-3=-5(t^2-1t)$

③ $h-3-\frac{5}{4}=-5(t^2-1t+1/4)$

④ $h-\frac{12}{4}-\frac{5}{4}=-5(t-1/2)^2$

$h-17/4=-5(t-1/2)^2$

⑤ $h=-5(t-1/2)^2+17/4$

Vertex $(1/2, 17/4)$

She reaches a maximum height of $17/4$m (4.25m) after $1/2$ (0.5) seconds.

Jun 3-1:41 PM

c) $0 = -5t^2 + 5t + 3$

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

$x = \frac{-5 \pm \sqrt{(5)^2-4(-5)(3)}}{2(-5)}$

$x = \frac{-5 \pm \sqrt{25+60}}{-10}$

$x = \frac{-5 \pm \sqrt{85}}{-10}$

$x = \frac{-5 \pm 9.22}{-10}$

$x = \frac{-5+9.22}{-10}$

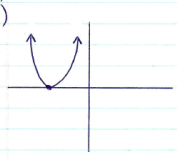
$x = -0.422$ seconds

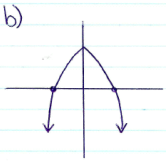
$x = \frac{-5-9.22}{-10}$

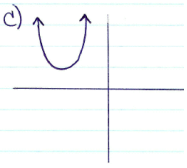
$x = 1.422$ seconds

Jun 3-1:41 PM

8.

a) 

b) 

c) 

9. One real root $\Rightarrow D = 0$

$y = x^2 - 3x + k$

$a = 1, b = -3, c = k$

$D = b^2 - 4ac$

$0 = (-3)^2 - 4(1)(k)$

$0 = 9 - 4k$

$\frac{4k}{4} = \frac{9}{4}$

$k = \frac{9}{4}$

Jun 3-1:42 PM

10. 2 real roots $\Rightarrow D > 0$

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

$a = 1, b = -8, c = k$

$D = b^2 - 4ac$

$b^2 - 4ac > 0$

$(-8)^2 - 4(1)(k) > 0$

$64 - 4k > 0$

$\frac{-4k}{-4} > \frac{-64}{-4}$

$k < 16$

Jun 3-1:42 PM

11. a) $t_n = 3n^3 + 2n^2 - 4$

$t_1 = 3(1)^3 + 2(1)^2 - 4$

$t_1 = 3(1) + 2(1) - 4$

$t_1 = 3 + 2 - 4$

$t_1 = 1$

$t_2 = 3(2)^3 + 2(2)^2 - 4$

$t_2 = 3(8) + 2(4) - 4$

$t_2 = 24 + 8 - 4$

$t_2 = 32 - 4$

$t_2 = 28$

$t_3 = 3(3)^3 + 2(3)^2 - 4$

$t_3 = 3(27) + 2(9) - 4$

$t_3 = 81 + 18 - 4$

$t_3 = 95$

$\{1, 28, 95\}$

Jun 3-1:42 PM

b) $t_n = n^2 + 4n - 8$

$t_1 = (1)^2 + 4(1) - 8$

$t_1 = 1 + 4 - 8$

$t_1 = -3$

$t_2 = (2)^2 + 4(2) - 8$

$t_2 = 4 + 8 - 8$

$t_2 = 4$

$t_3 = (3)^2 + 4(3) - 8$

$t_3 = 9 + 12 - 8$

$t_3 = 13$

$\{-3, 4, 13\}$

Jun 3-1:42 PM

12. $\frac{1}{a}(y-k) = (x-h)^2$

a) Up/Down $\Rightarrow$ "k"

b) left/Right $\Rightarrow$ "h"

c) become wider or narrower $\Rightarrow$ "a"

Jun 3-1:42 PM