ANSWER KEY (PART I)

1.	A	26.	C
2.	A	27.	B
3.	A	28.	D
4.	C	29.	D
5.	D	30.	B
6.	D	31.	A
7.	B	32.	B
8.	A	33.	A
9.	C	34.	C
10.	B	35.	A
11.	C	36.	C
12.	B	37.	C
13.	A	38.	D
14.	D	39.	B
15.	C	40.	A
16.	A	41.	A
17.	D	42.	C
18.	D	43.	B
19.	B	44.	D
20.	D	45.	C
21.	D	46.	C
22.	B	47.	D
23.	D	48.	B
24.	B	49.	D
25.	A	50.	D

PART II (Answer Key)

4 **51. Algebraically determine the EXACT roots in simplest form for** $\frac{3x}{x-3} = \frac{2}{x+4}$

$$\frac{3x}{x-3} = \frac{2}{x+4}$$

$$3x(x+4) = 2(x-3) \quad \{0.5\}$$

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

$$3x^2 + 10x + 6 = 0 \quad \{1\}$$

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

$$x = \frac{-10 \pm \sqrt{(-10)^2 - 4(3)(6)}}{2(3)} \quad \{1\}$$

$$x = \frac{-10 \pm \sqrt{28}}{6} \quad \{0.5\}$$

$$x = \frac{-10 \pm 2\sqrt{7}}{6} \quad \{0.5\}$$

$$x = \frac{-5 \pm \sqrt{7}}{3} \quad \{0.5\}$$

$$\therefore \left\{ \frac{-5+\sqrt{7}}{3}, \frac{-5-\sqrt{7}}{3} \right\}$$

4

52. Change $y = 3x^2 - 12x + 17$ **to standard form.**

EITHER

$$y = 3(x^2 - 4x + 4) + 17 - 12$$

$$y = 3(x-2)(x-2) + 5$$

$$y = 3(x-2)^2 + 5$$

OR

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

$$h = \frac{-b}{2a} = \frac{-12}{2(3)} = -2 \quad \{1\}$$

$$k = 3(-2)^2 - 12(-2) + 17 \quad \{1\}$$

$$a = 3$$

$$\therefore \ y = 3(x-2)^2 + 5 \quad \{2\}$$

4 **53.** **A parabola has vertex $(1,7)$ and passes through the point $(3,-1)$. Write the equation of the parabola in transformational form.**

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

$\frac{1}{a}(y-7)=(x-1)^2 \quad \{1\}$

$\frac{1}{a}(-1-7)=(3-1)^2 \quad \{1\}$

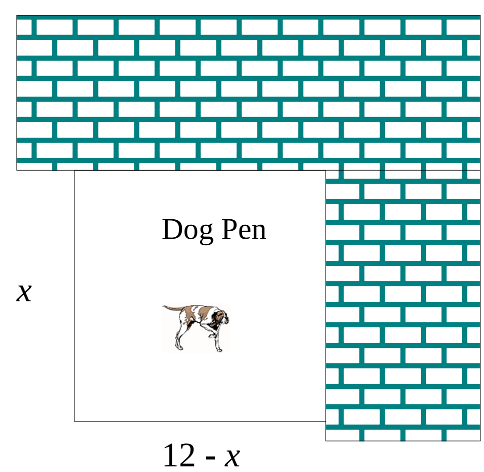
$\frac{1}{a}(-8)=4$

$\frac{1}{a}=\frac{4}{-8}$

$\frac{1}{a}=-\frac{1}{2} \quad \{1\}$

$\therefore$ the equation is $-\frac{1}{2}(y-7)=(x-1)^2 \quad \{1\}$

4 **54.** **Sue has 12*m* of fencing to make a rectangular dog pen in the corner of a building (as shown in the diagram.) Algebraically determine the dimensions of the dog pen that would yield the maximum area.**



$Area = x(12-x) \quad \{2.0\}$

$A = 12x - x^2$

$A = -x^2 - 12x \quad \{0.5\}$

$x-value\ (vertex) = \frac{-b}{2a} = \frac{-12}{2(-1)} = 6 \quad \{1\}$

one side 6 the other side 12 - 6 = 6 $\{0.5\}$

$\therefore$ The dimensions are 6*m* by 6*m*.

4 **55.** **Two consecutive even numbers have a product of 360. Write a quadratic equation and use it to find the numbers.**

$x =$ smaller number
$x+2 =$ larger number

$p(x) = x(x+2) \quad \{1.5\}$

$360 = x^2 + 2x$

$0 = x^2 + 2x - 360 \quad \{0.5\}$

$0 = (x-18)(x+20)$

$x = 18$ or $x = -20 \quad \{1\}$

$\therefore$ The two numbers are 18 and 20 OR -20 and -18. $\{1\}$

4 **56.** **The path of a toy rocket is modeled by $h(t) = -5t^2 + 50t + 6$, where $h(t)$ represents the height above the ground, in metres, and t represents the time, in seconds, after it is launched. Algebraically determine the time the toy rocket reached its maximum height and this height?**

$$h(t) = -5t^2 + 50t + 6 -$$

$$t - \text{value(vertex)} = \frac{-50}{2(-5)} = 5 \quad \{2\}$$

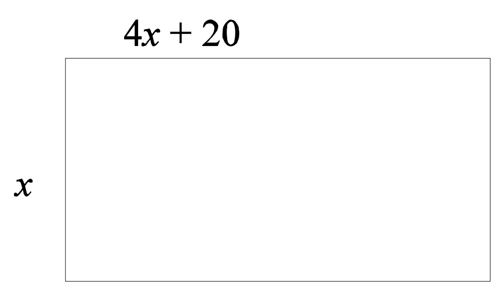
$$h - \text{value(vertex)} = -5(5)^2 + 50(5) + 6 = 131 \quad \{2\}$$

$\therefore$ The rock will reach a maximum height of 131m at 5 seconds.

4 **57.** **The length of a rectangular garden is 20*m* more than 4 times its width. If the area of the garden is $144m^2$, write a quadratic equation to represent the area and use it to find the dimensions of the rectangle.**

$x =$ the width

$4x + 20 =$ the length



$$A(x) = x(4x + 20) \quad \{1\}$$

$$144 = 4x^2 + 20x$$

$$0 = 4x^2 + 20x - 144 \quad \{0.5\}$$

$$0 = x^2 + 5x - 36$$

$$0 = (x - 4)(x + 9)$$

$$x = 4 \quad \text{OR} \quad x = -9 \quad \{1.5\}$$

$$-9 \leftarrow \text{inadmissible} \quad \{0.5\}$$

$\therefore$ The dimensions of the rectangle are $4m \times 36m$. $\{0.5\}$

4 **58.** **A rock is tossed into a pond. The formula for the area of the circular wave is given by $A = \pi r^2$. Calculate the average rate of change in the area when the radius increases from 2*m* to 3*m*.**

$$A(3) = 3.14(3)^2 = 28.26 \quad \{1\}$$

$$A(2) = 3.14(2)^2 = 12.56 \quad \{1\}$$

$$AROC = \frac{28.26 - 12.56}{3 - 2} = \frac{15.7}{1} = 15.7 \quad \{2\}$$

$\therefore$ the average rate of change in area is $15.7\, {}^{m^2}\!/_{m}$.

4 **59.** **A snowball is thrown into the air. The snowball's height, *h*, in metres, *t* seconds after it is thrown is modeled by $h(t) = -5t^2 + 20t + 2$. What is the approximate instantaneous rate of change of the snowball's height at 2.0 seconds? Explain what is happening at that instant.**

$$h(2.1) = -5(2.1)^2 + 20(2.1) + 2$$
$$h(2.1) = 21.95 \quad \{1\}$$

$$h(1.9) = -5(1.9)^2 + 20(1.9) + 2$$
$$h(1.9) = 21.95 \quad \{1\}$$

$$IROC = \frac{21.95 - 21.95}{0.2} = 0 \quad \{1\}$$

The IROC at 2 seconds is $0\, {}^{m}\!/_{s}$.

The snowball is stopped OR at its highest point OR has zero vecocity at this instant. {1}

3 **60.** **Solve for *x*:** $\frac{1}{125} = 5^{2x+1}$

$$\frac{1}{125} = 5^{2x+1}$$

$$\frac{1}{5^3} = 5^{2x+1} \quad \{0.5\}$$

$$5^{-3} = 5^{2x+1} \quad \{0.5\}$$
$$-3 = 2x + 1 \quad \{1\}$$

$$-4 = 2x$$

$$-2 = x \quad \{1\}$$

4 **61. In 2005 the value of an antique Ford Mustang was $24 000. The value of the car is increasing at a rate of 7.5% per year. What will be the value of the car in 2012?**

$y = a \cdot b^x$

$y = 24000(1.075)^x$ {2}

$y = 24000(1.075)^7$ {1}

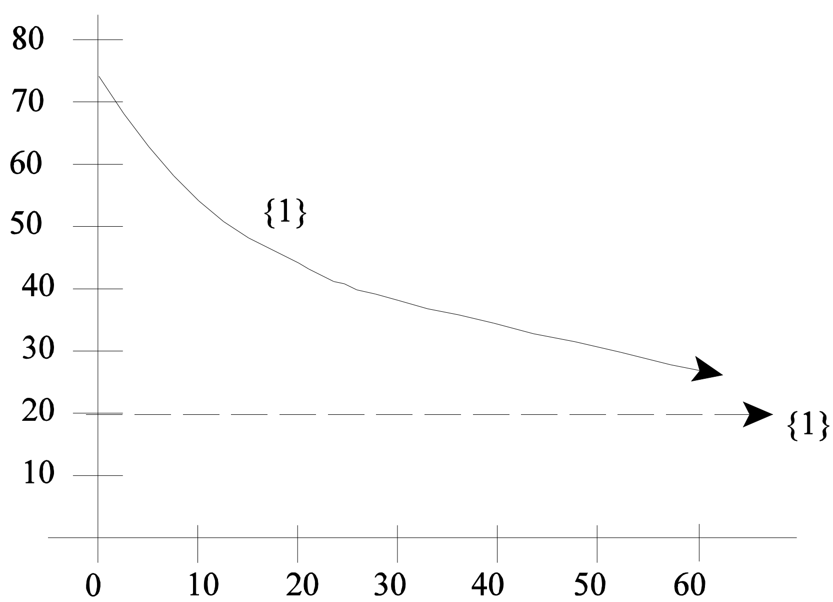
$y = 39817.18$ {1}

$\therefore$ the value of the car in 2012 will be $39817.18

3 **62. The cooling of a bowl of soup is modeled by $T = 52(0.87)^{\frac{x}{3}} + 21$, where *T* is the temperature in °C and *x* is the time in minutes. Sketch a labeled graph, including the asymptote, for the first hour.**

x	*T*
0	73
10	54
20	42
30	34
40	29
50	26
60	24

{1}



4 **63. The table shows the population of moose on the Northern Peninsula over a period of time. Determine the equation of the function which models population of moose, *p*, over a period of time, *t*. Use this equation to approximate the population of moose after 32 years.**

+5 +5 +5

Time (t) in years	0	5	10	15
Population (p)	4000	3200	2560	2048

×0.8 ×0.8 ×0.8

$y = a \cdot (b)^{\frac{x}{c}}$

$c =$ common difference in $t = 5$

$b =$ common ratio in $p = 0.8$

$a =$ initial value $= 4000$

$\therefore\ p = 4000 \cdot (0.8)^{\frac{t}{5}} \quad \{3\}$

$p = 4000 \cdot (0.8)^{\frac{32}{5}} = 959 \quad \{1\}$

After 32 years the approximate moose population would be 959.