**Lesson 5.2 – Linear and Quadratic Models**

***Goal: Apply linear models to analyze and predict behaviour of real-world situations***

***Apply quadratic models to analyze and predict behaviour of real-world situations***

***Tables***, ***graphs***, and ***equations*** are all examples of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Linear Models***

Represent quantities that increase or decrease by a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ amount over \_\_\_\_\_\_\_\_\_\_\_ intervals

* In a table of values, the first differences are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* The graph is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* The equation of the line can be written in the form \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, where \_\_\_\_\_\_ is the slope and \_\_\_\_\_\_\_\_ is the vertical intercept (y-intercept)
* The rate of change is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***EXAMPLE 1*** Which models represent linear relations?

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |

|  |  |
| --- | --- |
| **Time (s)** | **Height (m)** |
| 0 | 60 |
| 1 | 55 |
| 2 | 40 |
| 3 | 15 |

 |  |

|  |  |
| --- | --- |
| **Time (h)** | **Earnings ($)** |
| 0 | 0 |
| 5 | 40 |
| 10 | 80 |
| 15 | 120 |

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|  |  |  |  |
|  |  |  |  |

***Analyzing Graphs of Linear Relations***

In real world graphs of linear relations:

* The vertical intercept represents the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ value of the ***dependent*** variable
* The slope represents the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the ***dependent*** variable with respect to the ***independent*** variable

***EXAMPLE 2*** A cup of coffee is reheated in a microwave. The temperature, *C* degrees Celsius, of the coffee after *t* seconds can be modelled by the following linear equations. Explain what the numbers in the equations represent. How do the two equations compare to each other?![C:\Users\Vicki\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\MK0D7N5K\MC900239561[1].wmf]()

 ***500 W microwave:*** ***1000 W microwave:*** 

***Quadratic Models***

Represent quantities that are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ which do not have a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ rate of change

* In a table of values, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ differences are equal
* The graph is a curve called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* The equation has a degree of \_\_\_\_\_\_ and is written in the form \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ where \_\_\_\_\_

***EXAMPLE 3*** Which models represent quadratic relations?

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |

|  |  |
| --- | --- |
| ***h*** | ***p*** |
| 0 | 250 |
| 1 | 238 |
| 2 | 202 |
| 3 | 142 |

 |  |

|  |  |
| --- | --- |
| ***r*** | ***Q*** |
| 0 | 32 |
| 1 | 48 |
| 2 | 72 |
| 3 | 108 |

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|  |  |  |  |
|  |  |  |  |

**Practice**: Page 293 #1 – 6, 10, 11 Page 303 #1 – 3, 7bc