**Recognizing Quadratic Functions by Table**

Complete the columns below for the given functions. Notice that the *x*’s are always increasing by the same amount, that is ∆*x* = 1.

1. $f(x)=x^{2}$

|  |  |  |  |
| --- | --- | --- | --- |
| ***x*** | ***y* = *f*(*x*)** | **First difference Δ*y*** | **Second difference Δ(Δ*y*)** |
| -2 | 4 | ------- | ------ |
| -1 | 1 | 1 – 4 = –3 | ------- |
| 0 | 0 | 0 – 1 = –1 | –1 – (–3) = |
| 1 | 1 | 1 – 0 = 1 | 1 – (–1) = |
| 2 | 4 | 4 – 1 =  |  |
| 3 | 9 |  |  |

1. $f(x)=3x^{2}$

|  |  |  |  |
| --- | --- | --- | --- |
| ***x*** | ***y* = *f*(*x*)** | **First difference Δ*y*** | **Second difference Δ(Δ*y*)** |
| -2 | 12 | ---- | ---- |
| -1 | 3 | 3 – 12 = | ------ |
| 0 |  |  |  |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |

1. $f\left(x\right)=2x^{2}-1$

|  |  |  |  |
| --- | --- | --- | --- |
| ***x*** | ***y* = *f*(*x*)** | **First difference Δ*y*** | **Second difference Δ(Δ*y*)** |
| -2 |  | ---- | ---- |
| -1 |  |  | ------ |
| 0 |  |  |  |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |

1. $f\left(x\right)=-5x^{2}+4$

|  |  |  |  |
| --- | --- | --- | --- |
| ***x*** | ***y* = *f*(*x*)** | **First difference Δ*y*** | **Second difference Δ(Δ*y*)** |
| -2 |  | ---- | ---- |
| -1 |  |  | ------ |
| 0 |  |  |  |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |

1. $f\left(x\right)=5x^{2}+x+6$

|  |  |  |  |
| --- | --- | --- | --- |
| ***x*** | ***y* = *f*(*x*)** | **First difference Δ*y*** | **Second difference Δ(Δ*y*)** |
| -2 |  | ---- | ---- |
| -1 |  |  | ------ |
| 0 |  |  |  |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |

1. $f\left(x\right)=4x^{2}-2x$

|  |  |  |  |
| --- | --- | --- | --- |
| ***x*** | ***y* = *f*(*x*)** | **First difference Δ*y*** | **Second difference Δ(Δ*y*)** |
| -2 |  | ---- | ---- |
| -1 |  |  | ------ |
| 0 |  |  |  |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |

1. The changes in *y*, Δ*y*, are not constant (while the changes in *x*, Δ*x* are) so you know these tables cannot be defining linear functions. Why?
2. The changes in *y*, Δ*y*, do follow a pattern. What is that pattern?
3. What can we say must be true about the second differences, Δ(Δ *y*), if the function described by a table is quadratic?
4. If you have a table of values where the changes in *x* are constant, explain how you can tell whether the table describes a linear, an exponential or a quadratic function.
5. Graph each of the functions using the first columns as inputs and the second columns as outputs. The graphs should look like parabolas. Your teacher will provide graph paper.