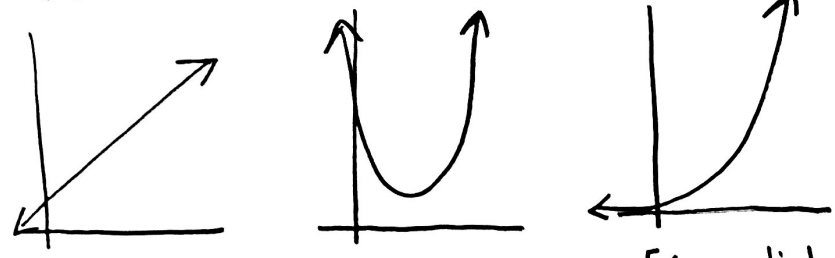
# 8.4 Comparing Functions

## Graphs



Linear | Quadratic | Exponential

* Fastest growth rate

## Equations

### Linear ($x$)

$y = mx + b$

$m$: slope

$b$: y-int

### Exponential ($5^x$)

$y = a \cdot b^x$

$a$: initial value (y-int)

$b$: growth/decay factor

### Quadratic ($x^2$)

* $y = a(x-h)^2 + k$
  Vertex: $(h, k)$

* $y = ax^2 + bx + c$
  Vertex: $(\frac{-b}{2a}$, plug it in)

$y = a(x-p)(x-q)$
Vertex:
(halfway between x-int, plug in

## Tables

### Linear

| x | y | |
|---|---|---|
| 0 | 20 | > +10 |
| 1 | 30 | > +10 |
| 2 | 40 | > +10 |
| 3 | 50 | |

Constant rate of change

### Quadratic

| x | y | | |
|---|---|---|---|
| -1 | -17 | > +10 | |
| 0 | -7 | > +6 | > -4 |
| 1 | -1 | > +2 | > -4 |
| 2 | 1 | > -2 | > -4 |
| 3 | -1 | > -6 | > -4 |
| 4 | -7 | | |

2nd rate of change is constant

### Exponential

| x | y | * |
|---|---|---|
| 0 | 144 | > ÷12 |
| 1 | 12 | > ÷12 |
| 2 | 1 | > ÷12 |
| 3 | $\frac{1}{12}$ | |

Multiply/divide each time

* ÷12 is the same as $\times \frac{1}{12}$

## Word Problems

### Linear

Constant rate of change
ex: $10 per day, 20 miles per hour

### Quadratic

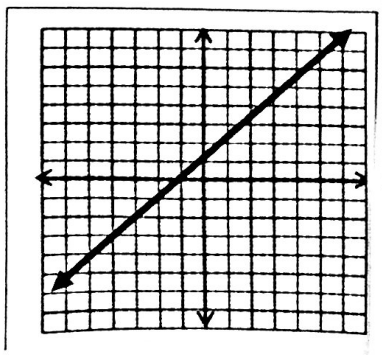
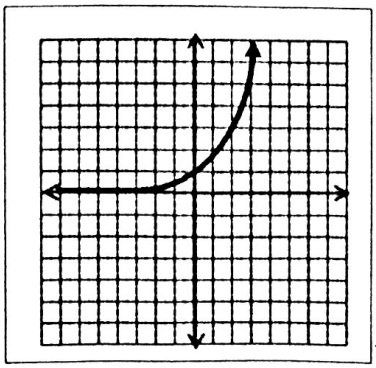
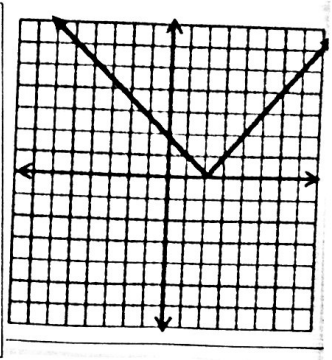
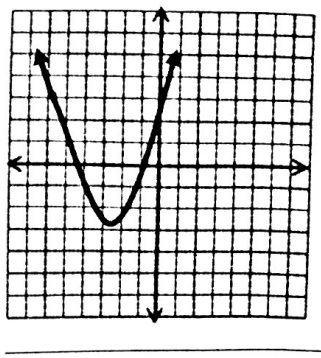
Kicking a ball, diving, increasing & decreasing
ex: Profits increase, hit a max, then decrease

### Exponential

Multiply or divide each time, % increase or decrease
ex: 20% growth rate, doubles, triples, half of it, third of it

# Fun with Functions!

Name: _____ Hour: _____

| | Linear Functions | Exponential Functions | Absolute-Value Functions | Quadratic Functions |
|---|---|---|---|---|
| **Definition** | **Definition:** A function that is graphed as a straight line and has a constant rate of change (positive or negative). | **Definition:** A function that is graphed as a partially curved line that portrays VERY fast increase or decrease of one variable. (Growth or decay) | **Definition:** A function that is graphed as a v - shape and shows only positive values for y. (Linear pattern until it reaches the vertex, then the pattern reverses in the other direction.) | **Definition**: A function that is graphed as a parabola (or u-shape) and shows increase and decrease of one variable. |
| **Equation** | $y = -\frac{2}{3}x + 7$ Just x $y = mx + b$ | $y = 5(3)^x$ x is exponent | $y = -\lvert x + 1 \rvert + 2$ $\lvert x \rvert$ | $y = 6x^2 + 11x - 35$ $x^2$ |
| **Real-World Situation** | Jon currently has $45 in his wallet. He earns 2 dollars for every newspaper he sells on his route. Constant ROC | Each year Gertrude counts her tulips in her garden. Over the past few years, she has noticed a definite pattern in that the number of tulips triples each year. x3 Multiply/divide | Jasmine's mother tells her she can travel 3 miles from her house in either direction; East or West. | Coach Cowell kicks a soccer ball in the air during gym class. He has the students measure the height of the ball from start to finish at 5 different times during the flight. |
| **Table** | X: 5, 6, 7, 8, 9 / Y: 33, 30, 27, 24, 21 (-3) Constant ROC | X: 0, 1, 2, 3, 4 / Y: ¼, 1, 4, 16, 64 (×4) Multiply/divide each time | X: -3, -2, -1, 0, 1 / Y: 0, 1, 2, 1, 0 (+1, +1, -1, -1) Constant in two directions | X: 4, 2, 0, -2, -4 / Y: 21, 9, 5, 9, 21 (-12, -4, +4, +12; +8, +8, +8) 2nd Rate of Change is constant |
| **Graph** |  |  |  |  |