Writing Equations of Lines

Find the eq of the line given: $f(1)=3$
$f(3)=7$

$(1,3)$ $(3,7)$

$$\frac{7-3}{3-1}=\frac{4}{2}=2$$

$y-3=2(x-1)$

$y-3=2x-2$

$+3$ $+3$

$y=2x+1$

Quadratic Equations:

Standard Form:

$$y = ax^2 + bx + c$$

Graphing or Vertex Form:

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

vertex: (h,k)
axis of symmetry x=h

how do you change from standard to vertex form???

$y = x^2 + 4x - 7$ $\frac{4}{2} = 2^2 = 4$

$y + 7 = (x^2 + 4x + 4)$
$+4$

$y + 11 = (x+2)^2 - 11$ $y = (x+2)^2 - 11$
-11

$y = 3x^2 + 4x - 2$

Write the eq. of the parabola w/ vertex (-2, -3) & point (-4, -5)

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

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

$-5 = a(-4+2)^2 - 3$

$-5 = a(-2)^2 - 3$

$-5 = 4a - 3$

$+3 \quad\quad +3$

$-2 = 4a$

$\overline{4} \quad \overline{4}$

$a = -1/2$

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

Formula for vertical free fall: (initial velocity) (initial height)

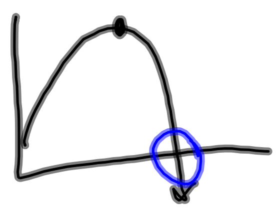
height $h = -16t^2 + v_o t + h_o$

Write an equation to model the path of a ball if a baseball player throws it with an initial velocity of 85 ft/sec. from a height of 5.5 feet.

What is the maximum height the baseball will reach? How many seconds will it take to reach that height?

$h = -16t^2 + 85t + 5.5$

graph, find max (time, height)



Variation

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Direct Variation: y varies directly as x if there is some nonzero constant k such that: $y = kx$

k is the constant of variation
x is the variable

product of a constant and variable

Inverse Variation: y varies inversely as x if there is some nonzero constant k such that $y = \frac{k}{x}$ $x \neq 0$

Joint Variation: y varies jointly as x & z if there is some nonzero constant k such that: $y = kxz$ $x \,\&\, z \neq 0$

End Behavior (polynomial) 21

End Behavior is determined by the degree of the polynomial and the coefficient of the leading term. The mathematical notation is written using limits.

$$\lim_{x \to -\infty} f(x) =$$ left end

$$\lim_{x \to \infty} f(x) =$$ right end

Odd Degree: the left & right ends go in opp. directions

(+) coeff.

$$\lim_{x \to \infty} f(x) = \infty$$

$$\lim_{x \to -\infty} f(x) = -\infty$$

(-) coeff.

$$\lim_{x \to \infty} f(x) = -\infty$$

$$\lim_{x \to -\infty} f(x) = \infty$$

Even Degree: both ends go in the same direction

(+) coeff. both up

$$\lim_{x \to \infty} f(x) = \infty$$

$$\lim_{x \to -\infty} f(x) = \infty$$

(-) coeff. both down

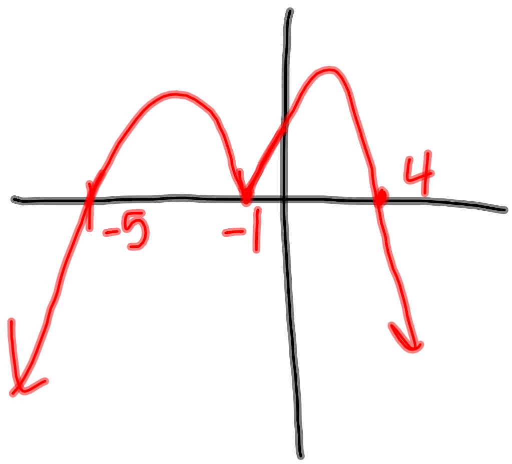
$$\lim_{x \to \infty} f(x) = -\infty$$

$$\lim_{x \to -\infty} f(x) = -\infty$$

Find the zeros of: $y = 3x^3 - 5x^2 + 2x$

$(x+5)(x+1)^{even}(x-4)$

Given the zeros, write a polynomial equation of given degree:



degree 5, zeros: 0, 2, -5

$x^2(x-2)(x+5)^2$

degree 4, zeros: -2, 2

degree 4, zeros: -5, 0, 5

multiplicity

The **power** of the factor determines the nature of the intersection at the point $x = a$.
(This is referred to as the multiplicity.)

Straight intersection:
$(x - a)^1$ The power of the zero is 1.

Tangent intersection :
$(x - a)^{even}$ The power of the zero is even.

Inflection intersection: **(like a slide through)**
$(x - a)^{odd}$ The power of the zero is odd.

Graph and decide end behavior

$$a) f(x) = x^3 + 2x^2 - 11x - 12$$

$$\lim_{x \to \infty} f(x) = \qquad \lim_{x \to -\infty} f(x) =$$

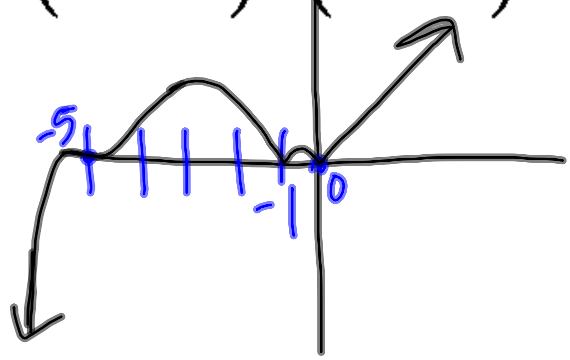
$$b) g(x) = 2x^4 + 2x^3 - 22x^2 - 18x - 35$$

$$\lim_{x \to \infty} g(x) = \qquad \lim_{x \to -\infty} g(x) =$$

Practice:

Sketch the graph of: $y = x^2 (x+5)^3 (x+1)^2$

D: 7 ↓ ↑
0: 2 Bounce
−5: 3 Slide
−1: 2 Bounce



$y = -5x^2 (x-2)^2 (x+4)^2$

Use the Remainder & Factor Thm. to find if the first polynomial is a factor of the second: (there are 2 ways)

$x-3$; x^3-x^2-x-15

Rational Root Theorem: #138

if all coefficients are integers and the constant is not 0, then all possible rational roots are:

$$x = \pm \frac{\text{factors of constant}}{\text{factors of leading coefficient}}$$

or $x = \pm \frac{p}{q}$ when

p = factors of constant

q = factors of leading coefficient

Prove all the zeros of $2x^4 - 7x^3 - 8x^2 + 14x + 8$ must lie in the interval [-2,5]

Find all the zeros of: $2x^4 - 7x^3 - 8x^2 + 14x + 8$

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