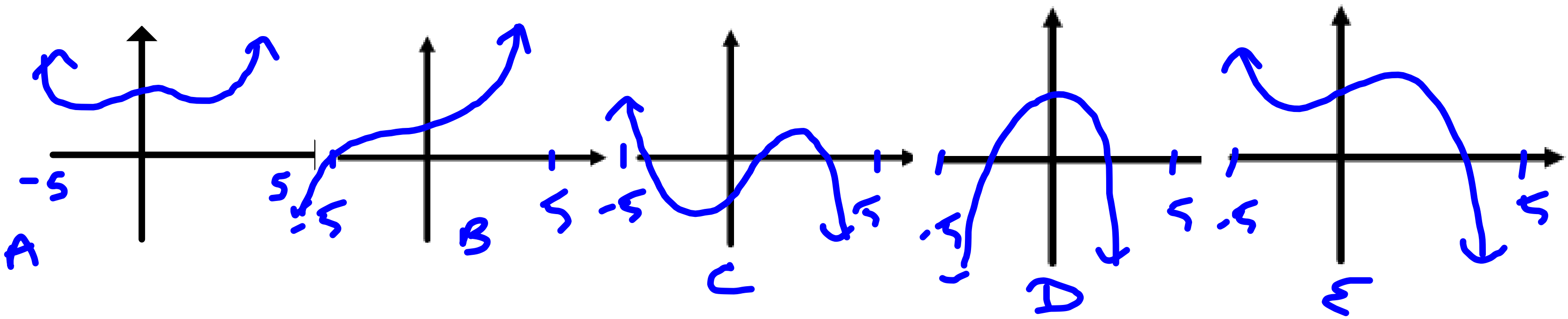
SAT QUESTION OF THE DAY

11. Which of the following is the graph of a function f such that f(x) = 0 for exactly two values of x between -5 and 5?



16. Let $\triangle x$ be defined as $x + 1/x$ for all non-zero integers x. If $\triangle x = t$ where t is an integer, which of the following is a possible value of t?

a. 1 b. 0 c. -1 d. -2 e. -3

WHAT ARE WAYS TO FIND THE ZEROS OF A QUADRATIC FUNCTION?

1. Factor the quadratic equation---make one side equal to zero.

2. Quadratic Formula

3. Complete the Square and solve the equation.

4. Graph it.

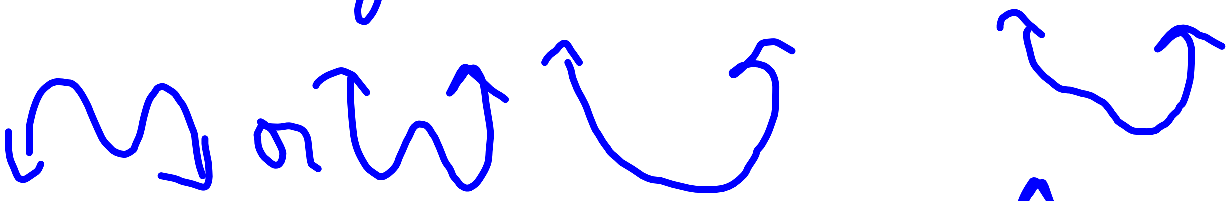
HOW TO FIND ZEROS OF POLYNOMIAL FUNCTIONS (if it's not quadratic)

1. Use the leading coefficient test to determine the left + right behavior.

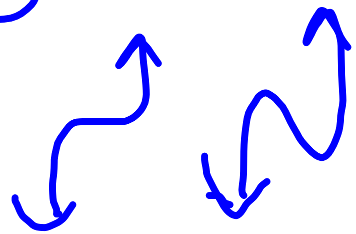
2. If $p(x)$

3. $p(x)$ has at most $n-1$ relative extrema $\Rightarrow$ relative max + relative min

Ex: $f(x)$ has degree 4 $\Rightarrow$ has at most 3 rel. extrema



$f(x)$ has degree 3 $\Rightarrow$



REAL ZEROS

f is a polynomial function and a is a real number

1. $x = a$ is a zero of the function.
2. $x=a$ is a solution of the equation $f(x) = 0$.
3. $(x - a)$ is a factor of $f(x)$
4. $(a,0)$ is the x-intercept.

FIND ALL THE ZEROS

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

$x^2(x-5)(x+2) = 0$

$x^2 = 0 \quad x-5=0 \quad x+2=0$

$x = 0 \text{ dr}, 5, -2$

$f(x) = x^5 - 6x^3 + 9x$

$= x(x^4 - 6x^2 + 9)$

$= x(x^2 - 3)^2$

$x = 0 \quad x^2 - 3 = 0 \quad x^2 - 3 = 0$

$x = 0 \quad x^2 = 3$

$x = \pm\sqrt{3} \text{ dR}$

$\{0, \pm\sqrt{3} \text{ dR}\}$

If you can't factor, use the calculator to find the zeros. The book will tell you to do so.

WRITE AN EQUATION GIVEN THE FOLLOWING ZEROS.

-2, 3, 0

$$f(x) = (x-a)(x-b)(x-c)$$
$$= (x-(-2))(x-3)(x-0)$$
$$= x(x+2)(x-3)$$
$$= x(x^2+2x-3x-6)$$
$$= x(x^2-x-6)$$
$$= x^3-x^2-6x$$

0, $6+\sqrt{3}$, $6-\sqrt{3}$

0, $6+\sqrt{3}$, $6-\sqrt{3}$

0, 6+√3, 6−√3

$$f(x) = (x-a)(x-b)(x-c)$$

$$= (x-0)[x-(6+\sqrt{3})][x-(6-\sqrt{3})]$$

$$= x\,[x-(6+\sqrt{3})][x-(6-\sqrt{3})]$$

$$= x\,[(x-6)-\sqrt{3}][(x-6)+\sqrt{3}]$$

$$= x\,[(x-6)^2-3]$$

$$= x\,[x^2-12x+\cancel{36}^{\,33}\cancel{-3}] \qquad (x-6)(x-6)$$

$$= x^3-12x^2+33x$$

Intermediate Value Theorem

If a function is continuous on a, b, and $f(a) < f(b)$, the f takes on all values between f(a) and f(b).

Use IVT to find intervals of length 1 in which the function is guaranteed to have a zero.

$f(x) = x^3 + 2x + 1$

1. Graph it.
2. find zero.
3. Look to left + right of zero

Interval $[-1, 0]$

Symmetry

x-axis symmetry: put in $-y \Rightarrow$ if you get what you started w/ it has x-axis

Ex: $x = y^2 + 7$

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

$x = y^2 + 7$ x-axis symmetry

y-axis symmetry: Put in $-x \Rightarrow$ get what you started

Origin symmetry $\Rightarrow$ Put in $(-x, -y) \Rightarrow$ Get what you started with

$xy = 10$

$(-x)(-y) = 10$

$xy = 10$ origin