Fall 2021 Pre-calculus
Lesson 5.2

Dr. O'Brien
Lehman High School
October 18th, 2021

students need calculators
no new vocab

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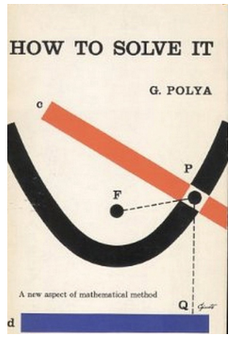
do now

be sure to: Get out your **binder**. Copy **goal** and answer **do now** questions below. Show all work or write a complete sentence for each answer:

1. Read through the how to solve it method.
2. What is the most difficult part of the method to do? Answer in a complete sentence.



class: pre-calculus **goal:** HDW use *how to solve it* to solve complex word problems?

+answers will vary. Make a plan can be hard, if you don't know where to start. (4) can also be hard, since people want to do as little work as possible.
+Why is it a good idea to understand the problem and then make a plan? because otherwise we don't know what we're doing!
+How do you start making a plan? Think about what you already know, and about how this problem resembles problems you've seen before.

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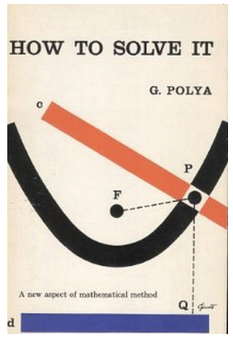

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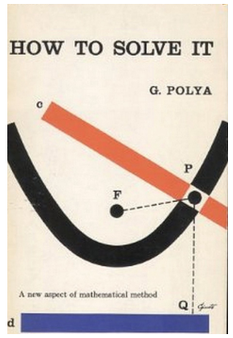

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how to solve it
1. Understand the problem:
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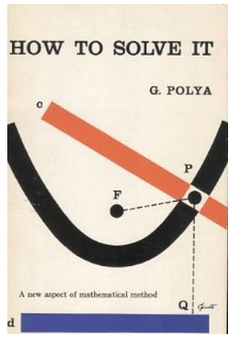

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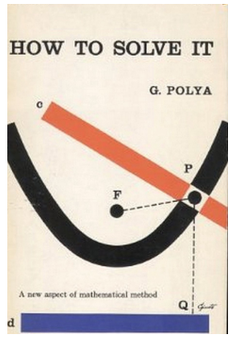

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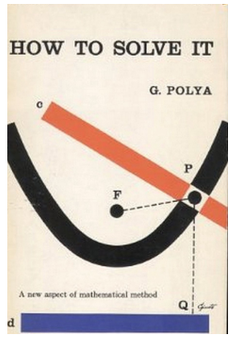

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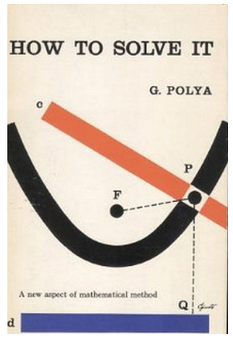

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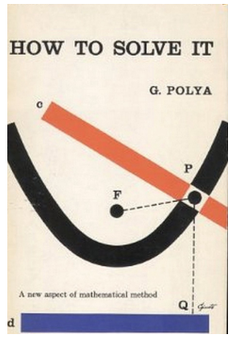

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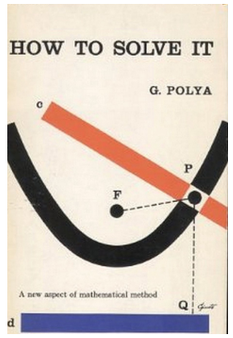

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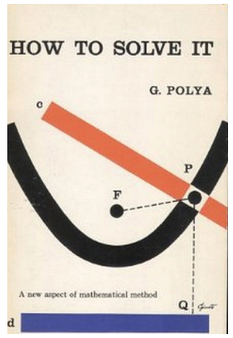

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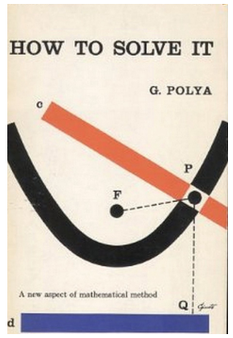

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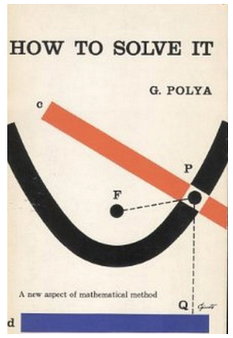

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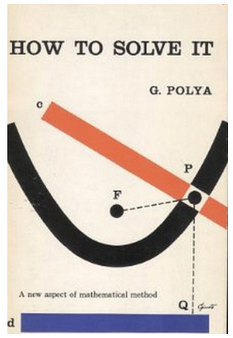
4. Review your work:
   a. Does your answer make sense?
   b. If not go back to (2). Do it again!!



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framing

class: pre-calculus **goal:** HDW use *how to solve it* to solve complex word problems?

the plan: We'll go through one of the Pset #5 word problems together.
You'll work with a partner to solve some other word problems

framing

- **what:** Use *how to solve it* to solve complex word problems

class: pre-calculus **goal:** HDW use *how to solve it* to solve complex word problems?

framing

- **what:** Use *how to solve it* to solve complex word problems
- **why:** This will help us break down difficult problems into smaller parts so we can apply our fundamental math skills!

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framing

- **what:** Use *how to solve it* to solve complex word problems
- **why:** This will help us break down difficult problems into smaller parts so we can apply our fundamental math skills!
- **where to:** Fun with polynomial functions

class: pre-calculus **goal:** HDW use *how to solve it* to solve complex word problems?

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1. Understand the problem:
   a. What information are we given?
   b. What would a sensible answer look like?

A pebble is dropped into a calm pond, causing ripples in the form of concentric circles. The radius (in feet) of the outermost ripple is given by *r* $r(t) = 0.6t$, where *t* is the time (in seconds) after the pebble strikes the water. The area of the circle is given by $A(r) = \pi r t^2$. Find the radius of the largest circle after 1.3 seconds.

class: pre-calculus **goal:** HDW use *how to solve it* to solve complex word problems?

a. A pebble is dropped in the pond. The ripples are 'concentric' circles. r(t) = 0.6t. A(r) = pi*rt^2.
b. A sensible answer would be a real number.
   +What could be an interval for this number?
   +Do we think the answer will be negative? no because all the numbers here are positive
   +will the answer be bigger than 10? hard to know but 1.3 is pretty small so probably not
   so we know that the answer is probably somewhere between 0 and 10

2. Make a plan:
   a. How does this problem resembles problems we've already seen?
   b. What would be a good first step?

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a. It resembles problems involving combinations of functions. In this case, it's specifically composite functions, because the radius goes into the area.
b. A good first step could be finding the composite of A and r.
   +How do we know whether to compose A with r or r with A? It's A with r because the input for A is a radius, which is the output for r.

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WORK THROUGH ON BOARD
r(t) = 0.6t
A(r) = pi r t^2

(A . r)(t) = A(r(t)) =
pi (0.6 t)t^2 = 0.6 pi t^3

We could appoximate the coefficient by multiplying 0.6 with pi, but right now I want to keep things as simple and accurate as possible.

Final step. plug t = 1.3
0.6 pi (1.3)^3 = 4.14

review work.
Go through our calculations. +Do we see any mistakes? maybe! it depends on if I do something wrong here.
+does this answer make sense, yes it's bigger than 0 and less than 10. So this seems like a reasonable answer!

3. Execute your plan

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activity

be sure to: Work with **one (!)** neighbor (someone right next to you!). Answer the questions below for each problem.

class: pre-calculus **goal:** HDW use *how to solve it* to solve complex word problems?

+How do I make a plan? Make sure you understand the question, then think about which combination of functions will make sense here.
+ how do I know if my answer is correct? Maybe check in with another group. If there 's a difference you can talk about what you did differently.

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1. **Understand the problem!**
   What question are you answering and
   what would be a reasonable answer?

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2. **Make a plan!**
   What combination of function will you use?

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2. **Make a plan!**
   What combination of function will you use?
3. **Execute plan!**
   Show all your work

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4. **Review your plan**
   Does your answer make sense? How can you solve it better?

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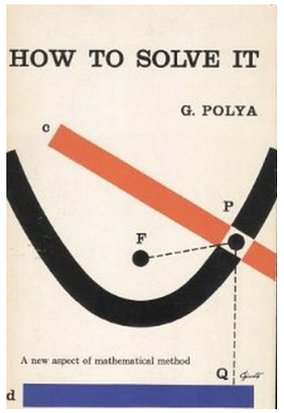

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1. Your highly successful vegan chopped cheese restaurant has two locations. The annual sales (in thousands of dollars) of each store can be given by the models:

   $S_1 = 973 + 1.3t^3$ and $S_2 = 349 + 72.4t$

   Where t is the year, with $t = 21$ corresponding to 2021.

   What will be the total sales in 2022?

class: pre-calculus **goal:** HDW use *how to solve it* to solve complex word problems?

See answer key.

2. The spread of a contaminant is increasing in a circular pattern on the surface of a lake. The radius of the contaminant can be modeled by $r(t) = 5.25\sqrt{t}$, where r is the radius in meters and t is time in hours since contamination. When the contaminated area will equal 6250 square meters

class: pre-calculus **goal:** HDW use *how to solve it* to solve complex word problems?

3. The number of bacteria in a refrigerated petri dish is given by

$$N(T) = 20T^2 - 80T + 500,$$
$$2 \le T \le 14$$

where T represents the temperature of the petri dish. When the petri dish is removed from the refrigerator, the temperature of the petri dish is given by

$$T(t) = 4t + 2, \quad 0 \le t \le 3$$

where t is time (in hours). When will the number of bacteria in the petri dish reach 2772?

class: pre-calculus **goal:** HDW use *how to solve it* to solve complex word problems?

Reflection

class: pre-calculus **goal:** HDW use *how to solve it* to solve complex word problems?

apply box method = -4x^3+4x^2 -2x + 3.
5. N.T(t) = 20(4t+2)^2 -80(4t+2) + 500 =
20(4t+2)[4t+2 - 4]
20(4t+2)(4t-2) + 500=
20[4t^2 -4] + 500 = 2000
1500/20 = 4t^2 - 4
79 = 4t^2

t = sqrt(79)/2

+is this in the domain of our function? no its about 4.44. so the bacteria count will never reach 2000.

Reflection

1. How was using the *how to solve it* method helpful?

Reflection

1. **How was using the *how to solve it* method helpful?**
2. **What was most challenging about the method?**

Reflection

1. **How was using the *how to solve it* method helpful?**
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Reflection

1. **How was using the *how to solve it* method helpful?**
2. **What was most challenging about the method?**
3. **Do you feel like you're more prepared to solve word problems in the future? Why or why not?**
4. **Before we go: Please arrange desks in rows!!**