# Algebra 2 Proficiency Self-Assessment
**for**
# Aspiring Precalc Honors Students

## Are You Really Ready for Precalc Honors?

The transition from Algebra 2 (regular or honors) to Precalc Honors is perhaps the most challenging of all transitions in the Bellarmine math curriculum. Even if you have qualified for Precalc Honors by meeting the grade prerequisites, the transition and the higher level of rigor will challenge you. Precalculus, more than any other level of math you've experienced so far, will ask you to draw on math concepts you have learned over the years and to apply them in combination, and in new ways. To be successful, you must have a solid command of these tools and you must recognize when to use them. The Honors version of Precalculus lifts the level of challenge to prepare students for success at advanced levels of math in college. The math in Precalc Honors is more rigorous, and the language is more formal compared to the regular version of the Precalculus course. The demands of the Honors course are also higher because it is designed to prepare students for an AP Calculus course.

## Assessment Instructions

This self-assessment will help you measure your command of Algebra 2 concepts and hence, your readiness for Precalc Honors. It will also help you reflect on whether you <u>really</u> want to take the course. The problems here cover Algebra 2 concepts that you have seen before. You may not initially recognize them because most of these problems call upon knowledge of multiple Algebra 2 concepts in combination, or in a slightly new context. But as stated above, **persevering with problems like these which you may not initially know how to solve is precisely what will be demanded of you in our Precalc Honors course.** The problems here also represent the typical level of rigor of the Precalc Honors course.

Sometime in the next week, please find a quiet place, give yourself at least an hour and attempt to solve the problems included in this assessment. Answer them on your own, without outside help from a tutor, the web, a textbook, your friends, or any other source. For your own sake, it's important for this self-assessment to be an honest experience. Please note that questions in Part 1 should be answered without a calculator but you may use a calculator for Part 2. **If you struggle with these problems, then it doesn't necessarily mean you shouldn't take Precalc Honors. What's most important to think about is how you feel about and respond to the struggle.**

## Things to Think About

After you have completed the assessment and checked your answers against the answer key provided, we ask that you take time to reflect on whether you really want to take Precalc Honors. Here are a few important things to consider:

- **You Gotta Enjoy It!** If you're not enjoying the struggle with these problems, then you're not likely to enjoy Precalc Honors. In Precalc Honors you will be asked to do quite a bit of rigorous problem-solving every day. You'll be given some guidance, but you'll be asked to struggle and

persevere more than in any other course you've taken so far. This challenge should excite you. If it doesn't then Precalc Honors at best will be a grind and at worst will be a frustrating experience.

- **You Gotta Be Ready to Ask for Help!** If you wrestle with these Algebra 2 problems and still cannot solve them then you should consider attending office hours this spring with your current Algebra 2 teacher to discuss the problems and get help. Your teacher has seen this document and is ready to talk through it with you. If you are not willing to attend office hours now, then you should consider not taking Precalc Honors next year. Attending office hours will be a common and essential ingredient to success in Precalc Honors.

- **You Gotta Make Time for Struggle!** If you are frustrated because the struggle with these problems is too time-consuming then Precalc Honors may not be the class for you. Precalc Honors will consistently present perseverance challenges that require additional time and effort and you will need to plan for both. Essentially, if you take Precalc Honors then you should plan to spend a lot more time on math next year.

- **You Gotta Want It!** It's possible—even likely—that the adjustment to the challenges of Precalc Honors might take time. Your grade on the first assessment might be a "D". This happens to many qualified students. How will you react to that? Will you give up and drop or will you keep trying? You should know that most students who stay and work hard are able to raise their grade over the course of the semester. Your final grade is not determined by that first D but rather by your commitment through the semester. It's also possible that you'll work hard through the semester to finish with less than an "A". How do you feel about that possibility? Are you willing to risk an A for the opportunity to learn math more deeply and at a higher level?

**If you are not prepared for the realities described above then you should decide, prior to May 4th, to take Regular Precalculus instead.** Your counselor can help you adjust your course requests until May 4th, when requests are locked in. There is a two-week drop period at the start of the school year but waiting to drop Precalc Honors in the fall is likely to be painful. A drop in September may require changing other classes in your course schedule which would force you to leave another class that you really like.

Precalc Honors is a fantastic foundational course for college math, but it is not for everyone and it is certainly not the only route to college math. **Regular Precalculus is also excellent preparation for college math--including STEM majors!** Students following the regular pathway have gone on to thrive in STEM majors at excellent universities. Both regular and honors will prepare you well. Ultimately, your decision whether to take Precalc Honors should depend on your enthusiasm for math, your drive to persevere through struggle, and your willingness to prioritize the course by reserving extra time in your schedule next year. If you'd like to talk through any aspect of this decision, then please feel free to contact your counselor and/or your math teacher (prior to May 4th).

***--The Bellarmine Math Department***

# PCH Self-Assessment

**Part 1** (no calculators)

1. State the domain and factor the algebraic expressions below. Simplify if possible.

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

b) $3x^{\frac{5}{3}} - 9x^{\frac{2}{3}} + 6x^{-\frac{1}{3}}$

2. Solve for *x*,

a) $\dfrac{qx+b}{cx+d} = 4$

b) $a - 2\left[b - 3(c-x)\right] = 6$

3. Find the domain for each inequality, then solve it. Use the interval notation to state your solution set.

a) $\dfrac{x}{x+1} > 3x$

b) $x^3 \le x$

c) $|2x-5| - 3 > 1$

d) $|2-5x| + 3 \le 5$

4. Present the expression below in the equivalent form without absolute value sign:
$|1-3x|$

5. Knowing that x < 2, write the expression $|3x-6|$ without absolute value sign.

6. Find the domain of each equation below and solve it.

a) $2x + \sqrt{x+1} = 8$

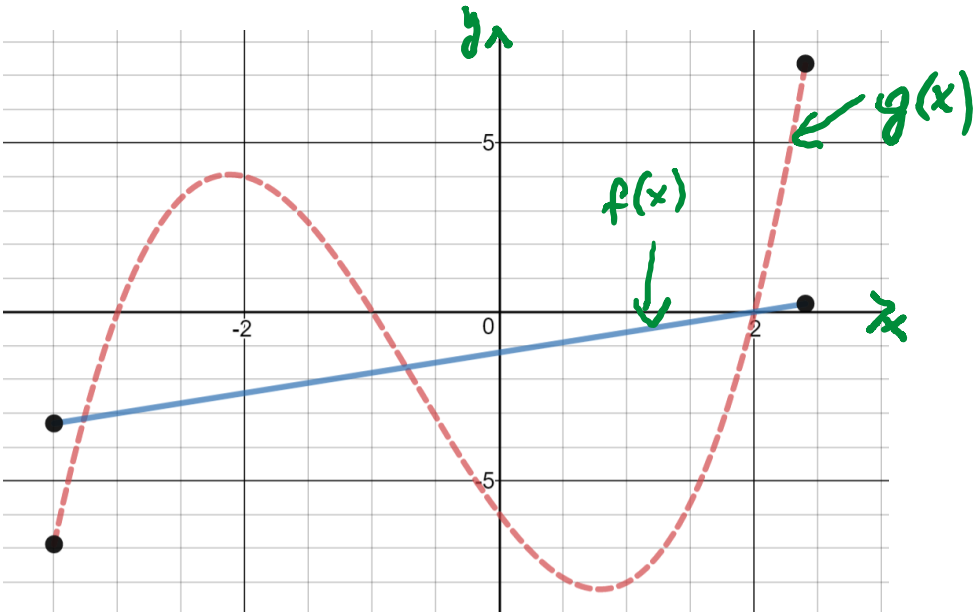
b) $\sqrt{x+1} - 3\sqrt[4]{x+1} - 4 = 0$

c) $\dfrac{x+5}{x-2} = \dfrac{5}{x+2} + \dfrac{28}{x^2-4}$

d) $-2x^2 + 3x = -8$

e) $4x^3 - 25x = 0$

**7. For a-g, use the graph below.**




Use the graphs to estimate the following:
a) domain and range of each function
b) f(-2)
c) solution set of the equation f(x) = -6
d) solution set of the equation f(x)=g(x)
e) solution set of the inequality f(x) > g(x)
f) g(f(-1)
g) solutions set of the equation g(f(x)) = -6
g) domain of f(g(x))

**Part 2** (with calculators)

1. Graph the function $Y_1 = x^3 - 5x^2 - 5x + 20$. Find the window in which you can see all important points and features of the graph. State the window. Copy the graph on your paper. Label axes.
   Clearly indicate units.

a) Use the graph to Solve the equation $x^3 - 5x^2 - 5x + 20 = 0$. Round your answer to the nearest **thousandth** of the unit.

b) Use the graph to state the solution set of the inequality $x^3 - 5x^2 - 5x + 20 > 0$.

# PCH Self-Assessment - Answers

**Part 1** (no calculators)

1.

a) $D=(0,\infty)$

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

b) $D=(-\infty,0)\cup(0,\infty)$

$$3x^{\frac{5}{3}}-9x^{\frac{2}{3}}+6x^{-\frac{1}{3}}=3x^{-\frac{1}{3}}(x-2)(x-1)$$

2. Solve for $x$,

a) $D=\left(-\infty,-\frac{d}{c}\right)\cup\left(-\frac{d}{c},\infty\right)$

$x=\frac{4d-b}{q-4c}$, when $q-4c\neq 0$

b) $D=(-\infty,\infty)$

$x=\frac{a-2b+6c-6}{6}$

3. a) $D=(-\infty,-1)\cup(-1,\infty)$

The solution set is $(-\infty,-1)\cup\left(-\frac{2}{3},0\right)$

b) $D=(-\infty,\infty)$

The solution set is $(-\infty,-1]\cup[0,1]$

c) $D=(-\infty,\infty)$

The solution set is $\left(-\infty,\frac{1}{2}\right)\cup\left(\frac{9}{2},\infty\right)$

d) $D=(-\infty,\infty)$

The solution set is $\left[0,\frac{4}{5}\right]$

4. $|1-3x| = \begin{cases} 1-3x & \text{if} \quad x \le \frac{1}{3} \\ 3x-1 & \text{if} \quad x > \frac{1}{3} \end{cases}$

5. $|3x-6| = -(3x-6)$

6. Find the domain of each equation below and solve it.

a) $D = [-1, \infty)$ $x = 3$

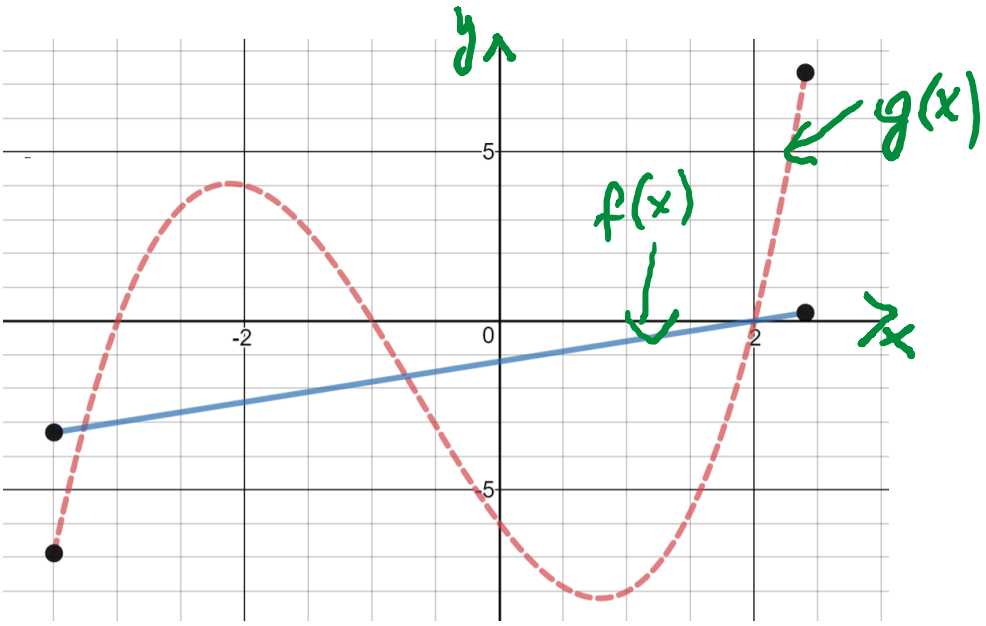
b) $D = [-1, \infty)$ $x = 255$

c) $D = (-\infty, -2) \cup (-2, 2) \cup (2, \infty)$ $x = -4$

d) $D = (-\infty, \infty)$ $x = \frac{3 \pm \sqrt{73}}{4}$

e) $D = (-\infty, \infty)$ $x = 0$ or $x = \frac{5}{2}$ or $x = -\frac{5}{2}$

**8. For a-g, use the graph below.**



Use the graphs to approximate the following:

a) domain and range of each function $D_f = [-3.5, 2.4]$ $R_f = [-3.2, 0.2]$

$D_g = [-3.5, 2.4]$ $R_g = [-8.2, 7.4]$

b) f(-2) = 2.4

c) solution set of the equation f(x) = -6 No Solution

d) solution set of the equation f(x)=g(x) $x = -3.25$ or $x = -0.75$ or $x = 2$

e) solution set of the inequality f(x) > g(x) $(-3.5, -3.25) \cup (-0.75, 2)$

f) g(f(-1) = 3.8

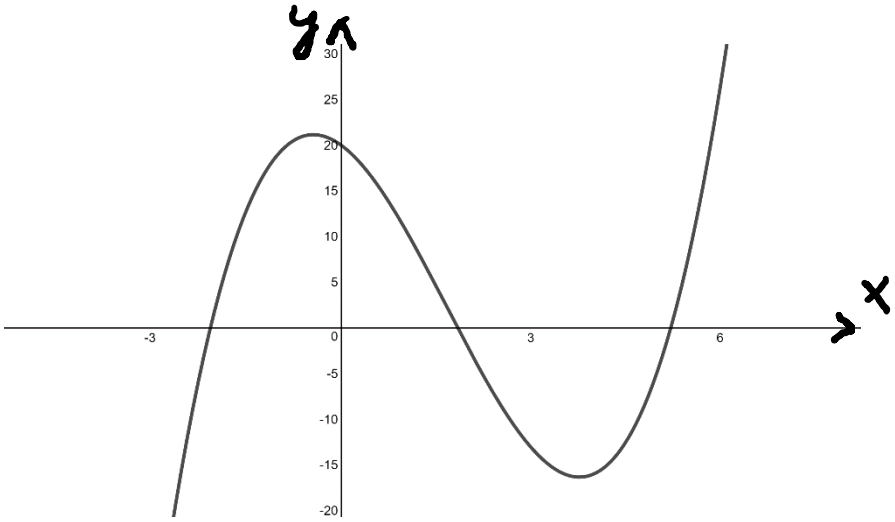
g) solutions set of the equation g(f(x)) = -6 $x = 2$

h) domain of f(g(x)) $D_{f(g(x))} = [-3.25, -2.7] \cup [-1.4, -0.45] \cup [1.7, 2.2]$

**Part 2** (with calculators)

2. Graph the function $Y_1 = x^3 - 5x^2 - 5x + 20$. Find the window in which you can see all important points and features of the graph. State the window. Copy the graph on your paper. Label axes.
   Clearly indicate units.

Window: $[-5, 8]_1 \times [-20, 30]_5$




a) Solve the equation $x^3 - 5x^2 - 5x + 20 = 0$. Round your answer to the nearest **thousandth** of the unit.
   The solutions of the equation are: -2.072, 1.848, 5.224.

b) Use the graph to state the solution set of the inequality $x^3 - 5x^2 - 5x + 20 > 0$.

   The solution set is: $(-2.072, 1.848) \cup (5.224, \infty)$.