HSML At My Pace (AMP) Honors Calculus I Course Preparedness Test

High School Math Live wants parents to be well informed. We want your student to be placed in the appropriate course so that they will be successful and challenged while learning the beauty of mathematics. Our year-long Honors Calculus I course is a college level course, equivalent to what most universities and colleges teach in one semester. Our pace is brisk and it is extremely important that your student have the needed skills to be successful in this rigorous course. The questions we have below will be a good indicator to whether your student is ready for our course. Completing approximately 80% correctly is a good sign that your student is ready for Calculus. There is no time limitation for completing this but if your student takes longer than 2 hours, it might suggest that this course would require more time designated for math practice in their schedule. If your student struggles with the majority of the questions, then you and your student will need discuss your plans. Will your student simply need to allow more time for math this year? Will your student need a private tutor? Will your student put forth the effort needed in order to be successful? We cannot answer these questions for you, but we want you to know prior to the school year what skills are needed for this course.

The answer key is provided at the end of the document. We ask that you sit down with your student and discuss their work. It is very important that you are aware of their results so that informative decisions can be made. After completing these problems, if you find that there are concepts that your student has not mastered, by request, we are willing to add a workshop to our Brush Up on Math workshops to get targeted help on those concepts. If you feel that input from an instructor of the course would be helpful, please scan their work and answers, making sure that the answers are in the same order as the problems on the document. The scan should be emailed as a single PDF document to support@highschoolmathlive.com.

Please view our website, www.highschoolmathlive.com, to read other details including what makes a successful HSML student and online learner.

ALL QUESTIONS SHOULD BE ANSWERED **WITHOUT** A CALCULATOR.

Note: Calculus students should be able to use their graphing calculator to:

1) *Locate the maximum/minimum points*
2) *Locate points of intersection*
3) *Locate the zeros of the function*
4) *Graph functions in an appropriate viewing window*

Also, Calculus students need to be able to answer questions regarding the Unit Circle without a calculator.

Part 1: Evaluate the following expressions. negative

1. $(-3)^4$
2. -2^2
3. 3^{-3}
4. $\left(\frac{3}{4}\right)^{-2}$
5. $8^{-2/3}$

Part 2: Simplify the following expressions. Leave no exponents.

1. $(3a^3b^4)(3a^2b^3)^2$
2. $\left(\frac{2x^{5/2}y^2}{x^3y^{-1/2}}\right)^{-2}$

Part 3: Expand and simplify.

1. $3(x-2)-3x(x-2)$
2. $(x+3)(2x-5)$
3. $(x-4)^2$
4. $(6-x)(-3)+(-\frac{3}{2}x+6)$

Part 4: Factor completely on the Real Number System.

1. $9x^2-16$
2. $3x^2+11x-4$
3. $4x^5y+18x^4y+20x^3y$
4. $(x+1)^3(2x-3)^2+(x+1)^2(2x-3)^3$
5. $-\frac{1}{2}x(6-x)^{-\frac{1}{2}}+(6-x)^{\frac{1}{2}}$
6. $-2x(x^2+1)^2-4x(-x^2+1)(x^2+1)$
7. $\frac{4}{3}x^{1/3}+\frac{4}{3}x^{-2/3}$

Part 5: Solve. Give only Real solutions.

1. $x+3=12-\frac{1}{2}x$
2. $\frac{2x}{x+1}=\frac{2x-1}{x}$
3. $x^2-x=6$
4. $3x(1-x)^{-1/2}-3(1-x)^{1/2}=0$
5. $2\sin^2 x-3\sin x+1=0$ on $[0,2\pi)$

Part 6: Solve the inequality.

1. $x^2 \le x+12$
2. $3x(x-1)(x+2)>0$

Part 7: Write the equation of the line in slope intercept form that passes through (-4, 1) and …

1. Has slope of -2.
2. Is parallel to the x-axis.
3. Is parallel to the line $3x-4y=12$.
4. Is perpendicular to the line $3x-4y=12$.

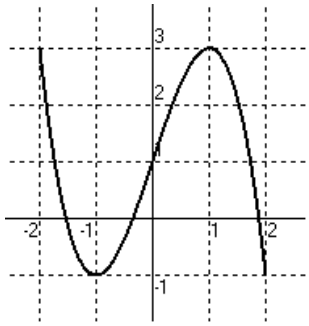
Part 8: Miscellaneous Topics

1. Find the slope between (-1, 4) and (3, -8)
2. Draw any graph that represents a function of x.
3. Solve this linear system by elimination or substitution.
$$\begin{aligned} 5x+4y&=12 \\ 7x-6y&=40 \end{aligned}$$
4. If $f(x)=x^2+x+1$, evaluate the difference quotient $\dfrac{f(1+h)-f(1)}{h}$
5. If $f(x)=x^2+x+1$ and $g(x)=x-3$ find the following function $f\circ g$.
6. Find the values of the following.
   a. $\sin(\frac{\pi}{3})$
   b. $\cos(\frac{3\pi}{2})$
   c. $\tan(\frac{3\pi}{4})$
   d. $\csc(\frac{7\pi}{6})$

Part 9: Basic Graphing. Sketch the following. Please show the asymptote for #4, 5.

1. $2x-5y=10$
2. $y=x^2-3$
3. $y=-x^2$
4. $y=e^x$
5. $y=\ln x$
6. $y=(x-1)(x+2)^2(x+6)$
7. $f(x)=\begin{cases} 1+x^2 & \text{if } x\le 1 \\ -2x-1 & \text{if } x>1 \end{cases}$

Part 10: Functions.



1. Use the picture of $f(x)$ to the right to answer the following:
   $f(x)$
   a. State the value of $f(1)$.
   b. Estimate the values of x where $f(x)=2$.
   c. State the domain and range of $f(x)$.
   d. State the interval(s) where $f(x)$ increases.

2. For $f(x)=\begin{cases} 1+x^2 & \text{if } x\le 1 \\ 3x+1 & \text{if } x>1 \end{cases}$, state the value of:
   a. $f(3)$
   b. $f(1)$
   c. $f(0)$

3. Find the domain of the following functions.
   a. $y=x^2-3x$
   b. $y=\dfrac{2x+3}{x^2-x-2}$
   c. $y=\sqrt{1-x}$
   d. $y=e^x$
   e. $y=\ln(3x-1)$

Answer Key:

Part 1

1. 81
2. -4
3. $\frac{1}{27}$
4. $\frac{16}{9}$
5. $\frac{1}{4}$

Part 2

1. $27a^7b^{10}$
2. $\frac{x}{4y^5}$

Part 3

1. $-3x^2+9x-6$
2. $2x^2+x-15$
3. $x^2-8x+16$
4. $\frac{3}{2}x-12$

Part 4

1. $(3x+4)(3x-4)$
2. $(3x-1)(x+4)$
3. $2x^3y(2x+5)(x+2)$
4. $(x+1)^2(2x-3)^2(3x-2)$
5. $\frac{-\frac{3}{2}x+6}{(6-x)^{1/2}}$ or $\frac{-3(x-4)}{2(6-x)^{1/2}}$
6. $-2x(x^2+1)(-x^2+3)$
7. $\frac{4(x+1)}{3x^{2/3}}$

Part 5

1. 6
2. 1
3. -2, 3
4. ½
5. $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{\pi}{2}$

Part 6

1. $[-3,4]$
2. $(-2,0) \cup (1,\infty)$

Part 7

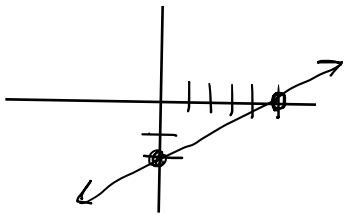
1. $y = -2x - 7$
2. $y = 1$
3. $y = \frac{3}{4}x + 4$
4. $y = -\frac{4}{3}x - \frac{13}{3}$

Part 8

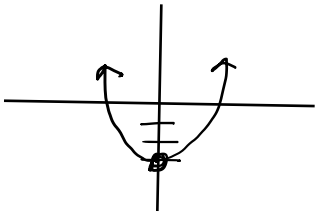
1. -3
2. A graph that passes the vertical line test.
3. $(4,-2)$
4. $h + 3$
5. $x^2 - 5x + 7$
6. $\frac{\sqrt{3}}{2}$, 0, -1, -2

Part 9 (These are not drawn to scale.)

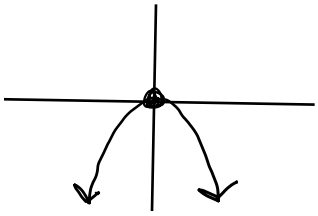
1. $y = \frac{2}{5}x - 2$



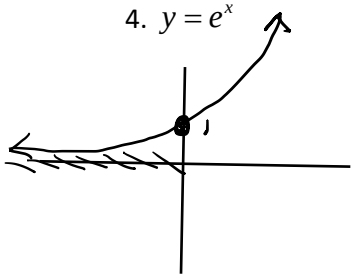
2. $y = x^2 - 3$



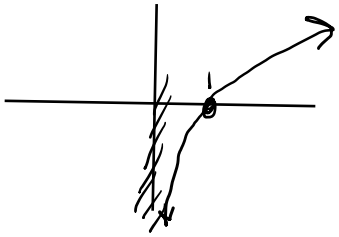
3. $y = -x^2$



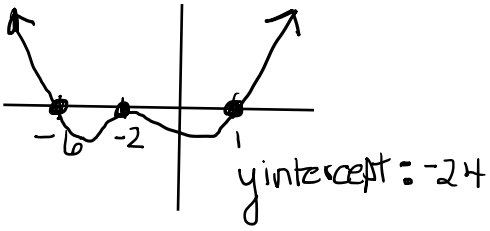
4. $y = e^x$



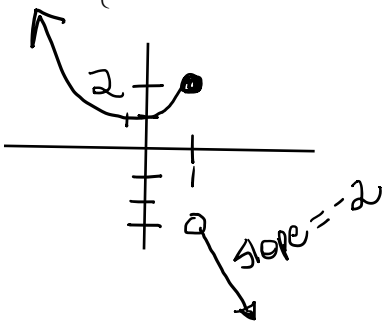
5. $y = \ln x$



6. $y = (x-1)(x+2)^2(x+6)$



7. $f(x) = \begin{cases} 1 + x^2 & \text{if } x \le 1 \\ -2x - 1 & \text{if } x > 1 \end{cases}$



Part 10

1. A. $f(1) = 3$ B. $x \approx -1.8,\ \frac{1}{3},\ \frac{3}{2}$ C. Domain: [-2, 2], Range: [-1, 3] D. (-1, 1)
2. A. $f(3) = 10$ B. $f(1) = 2$ C. $f(0) = 1$
3. A. $(-\infty, \infty)$ B. $(-\infty, -1) \cup (-1, 2) \cup (2, \infty)$ C. $(-\infty, 1]$ D. $(-\infty, \infty)$
   E. $(\frac{1}{3}, \infty)$