

1. What is a relation? A set of ordered pairs
2. What is a function? A relation in which each x is paired with only one y
3. Why is it important to make the distinction between relations and functions? Calculus applies only to functions
4. What is a verbally defined function? written statement
5. What is a numerically defined function? data; table
6. What is a geometrically defined function? graph
7. What is an algebraically defined function? $f(x) = \underline{\hspace{2cm}}$
8. What is the job of the inverse of a function? To reverse x and y
9. Know all 15 of the basic functions from CW 1.
10. How do you eliminate absolute value notation from a function definition? Leave expression alone if it is positive or zero; take the negative otherwise
11. If in solving an equation, you take an even root of a variable expression, what must you remember to do? Two cases: \pm
12. If in solving an equation or evaluating an expression, you take an even root of a constant expression, what must you remember to do? $+$ only
13. On YOUR calculator, can you
 - a. store a function in Y_1 , Y_2 , etc.?
 - b. use the home screen to evaluate your stored function(s) at different points?
 - c. use the intersection capabilities to solve equations or inequalities?
 - d. use the root finder to locate zeroes?
 - e. deselect a function so that it is stored but not graphed?
14. To how many decimal places must your FINAL answer be accurate? three
15. Give both forms of the definition of an even function.
 - a. algebraic $f(-x) = f(x)$
 - b. geometric y-axis symmetry

16. Give both forms for the definition of an odd function.

a. algebraic $f(-x) = -f(x)$

b. geometric origin symmetry

17. Give a verbal description of each transformation of $y = f(x)$. Include cases as needed.

a. $f(x-c)$ if $c > 0$ c units right if $c < 0$ $|c|$ units left

b. $f(cx)$ if $0 < c < 1$ horizontal stretch if $c > 1$ horizontal shrink

c. $f(-x)$ reflect in y-axis

d. $f(|x|)$ cut II & III, copy I & IV and reflect in y^{-ax} , paste together

e. $f(-|x|)$ cut I & IV, copy II & III and reflect in y^{-ax} , paste together

f. $f(x) + c$ if $c > 0$ up c units if $c < 0$ down $|c|$ units

g. $cf(x)$ if $0 < c < 1$ vertical shrink if $c > 1$ vertical stretch

h. $-f(x)$ reflect in x-axis

i. $|f(x)|$ Reflect III & IV in x-axis

j. $-|f(x)|$ Reflect I & II in x-axis

1. What is the average rate of change of $f(x)$ from $x = a$ to $x = b$?

$$\frac{f(b) - f(a)}{b - a}$$

2. Given data, describe 4 techniques for estimating the instantaneous rate of change of $f(x)$ when $x = c$.

- calculate slope
- a. Left Estimate connect $(c, f(c))$ to the data point on immediate left
 - b. Right Estimate connect $(c, f(c))$ to the data point on immediate right
 - c. Using both Left and Right Estimate Average the two

calculate slope

- d. Symmetric/Two-Sided Estimate connect the two points on the immediate right & left of $(c, f(c))$

3. How are the slope of a curve at a point and slope of a tangent to a curve at a point related?

Same quantity

4. What is the relationship between one and two sided limits? If two sided limit exists, the one sided limits must match

5. What behaviors will cause a limit to fail to exist? $\pm\infty$, right \neq left, oscillation of y-values

6. For piecewise functions, how do you decide what x-values are suspected of causing a nonexistent limit?
x-values where pieces change

7. What are the 2 important trigonometric limits you should know?

a. $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$

b. $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x} = 0$ (can get with conjugate and part a answer)

8. When will each of these methods for evaluating limits be used and what must you remember about using each method?

- a. Direct Substitution try first but check continuity
- b. Factor and Cancel $\frac{0}{0}$ and polynomials
- c. Multiply by the Conjugate $\frac{0}{0}$ and trig or radicals
- d. Common Denominator $\frac{0}{0}$ or $\frac{\#}{0} - \frac{\#}{0}$; compound fractions
- e. Substitution of Variables $\frac{0}{0}$ trig function with angle other than x
- f. Squeeze Theorem nothing else works or squeeze is given

9. What 5 items should you THINK but NOT WRITE when evaluating limits on FREE RESPONSE?

a. $\frac{1}{0^+} \rightarrow \infty$

b. $\frac{1}{0^-} \rightarrow -\infty$

- c. $\frac{1}{\infty} \rightarrow 0^{(+)}$
 d. $\frac{1}{-\infty} \rightarrow 0^{(-)}$
 e. $\ln 0^+ \rightarrow -\infty$

10. What angle measurement system must be used when working with trigonometric functions in calculus? radians

11. How should you deal with absolute value functions when evaluating limits or derivatives? eliminate absolute value notation

12. When will the greatest integer function have a nonexistent limit? when you try to [integer]

13. What are the 3 types of discontinuities, the limit behavior producing each, and the graphical consequence of each?

- a. point; $\lim_{x \rightarrow c} f(x)$ exists but is not $f(c)$; hole in graph
 b. jump; $\lim_{x \rightarrow c^+} f(x) \neq \lim_{x \rightarrow c^-} f(x)$; graph literally jumps
 c. infinite; $\lim_{x \rightarrow c^+} f(x) = \pm \infty$ or $\lim_{x \rightarrow c^-} f(x) = \pm \infty$; vertical asymptote

14. What distinguishes removable discontinuities from essential discontinuities? Discuss in terms of limits.

- a. removable - only point - $\lim_{x \rightarrow c} f(x)$ exists
 b. essential - jump & infinit - $\lim_{x \rightarrow c} f(x)$ DNE

15. How do you locate candidates for discontinuities from function descriptions? $\frac{0}{0}$, $\ln 0$, boundaries on piecewise

16. State all 3 parts of the formal definition of continuity for $y = f(x)$ at $x = c$.

- a. $\lim_{x \rightarrow c} f(x)$ exists
 b. $f(c)$ exists
 c. $\lim_{x \rightarrow c} f(x) = f(c)$

17. State the Intermediate Value Theorem. What is its purpose?

- a. IVT: If $f(x)$ is continuous on $[a, b]$, then f takes on all values between $f(a)$ and $f(b)$, inclusive.
 b. purpose: Determining what y -values are guaranteed.

18. In order to prove continuity on a piecewise function for the x -values where the piecewise function changes,

what must you show? Right and Left LIMITS for each x -value where the function changes.