

**MATH 173**      **Test 1 (Sec. P.1 - 2.1)**

1. (5 pts) Complete the table and use the result to estimate the limit  $\lim_{x \rightarrow 0} \frac{2^x - 1}{x}$ . Use a graphing utility to confirm your result.

$x$	-0.01	-0.001	-0.0001	0.01	0.001	0.0001
$f(x)$						

2. (5 pts) Given  $\lim_{x \rightarrow 3} (3x - 7) = 2$ . Find  $\delta$  such that  $|(3x - 7) - 2| < 0.009$  whenever  $|x - 3| < \delta$

3. (3 each) Find the limit.

a)  $\lim_{x \rightarrow 11} \frac{5x}{\sqrt{x-2}}$

b)  $\lim_{x \rightarrow 1} \begin{cases} x^3 + 1, & x < 1 \\ x + 1, & x \geq 1 \end{cases}$

4. (5 each) Graph the following functions showing **intercepts** and **asymptotes**. Make a table of values for both equations.

a)  $f(x) = \log_2 x$

b)  $f(x) = 2^{-x}$

$x$					
$y$	-2	-1	0	1	2

$x$	-2	-1	0	1	2
$y$					

5. (3 each) Evaluate: Solve the equation for  $x$ . If  $x$  is irrational, round your answer to three decimal places.

a)  $(x + 3)^{4/3} = 16$

b)  $10^{3 \log x} = 8$

6. (3 each) Evaluate **without** using a calculator:

a)  $\arccos\left(\frac{-\sqrt{3}}{2}\right)$

b)  $\sec\left(\arcsin\frac{4}{5}\right)$

7. (6 pts.) Given  $f(x) = \sqrt{x-2}$ . Find an equation for  $f^{-1}(x)$ , and give the domain and range of both  $f$  and  $f^{-1}$ .

8. (5 pts) Write as a single logarithm:

$$3 \log x - 2 \log y + 5 \log t - 4 \log w$$

9. (4 pts) Find the vertical asymptotes of the function  $f(x) = \frac{x}{x^2 + x - 2}$

10. (9 pts) Use the function  $f$  graphed below to answer the following questions.

a)  $f(0) =$

b)  $\lim_{x \rightarrow 0^-} f(x)$

c)  $\lim_{x \rightarrow 0^+} f(x)$

d) Does  $\lim_{x \rightarrow -1} f(x)$  exist?  
(Explain your answer)

e) Is  $f$  continuous at 0?  
(Explain your answer)

f) Is  $f$  differentiable at 0?  
(Explain your answer)

11. (5 pts.) Use the definition  $\left( f'(x) = \lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x) - f(x)}{\Delta x} \right)$  to find the derivative of the function  $f(x) = 1 - x^2$ .

12. (3 each) Find the given limit if it exists:

a)  $\lim_{x \rightarrow 0} \frac{\sin x \cos x}{3x}$

b)  $\lim_{x \rightarrow 2^-} ([x] - 2)$

c)  $\lim_{x \rightarrow (\pi/2)^-} \ln |\cos x|$

d)  $\lim_{x \rightarrow 3} \frac{x^2 - x - 6}{x^2 - 5x + 6}$

e)  $\lim_{x \rightarrow 0^-} \left( x^2 - \frac{2}{x} \right)$

f)  $\lim_{x \rightarrow 4} \frac{\sqrt{x+5} - 3}{x - 4}$

g)  $\lim_{x \rightarrow 0^-} \frac{|x|}{x}$

h)  $\lim_{x \rightarrow 0} \frac{\sin x(1 - \cos x)}{2x^2}$

13. (4 pts.) Determine the points of discontinuity of the function  $f(x) = \sec x$ , on the interval  $[-2\pi, 2\pi]$ .

14. (5 pts.) Find an equation of the tangent line to the graph of  $f(x) = x + 2$  at the point  $(7, 3)$ .

15. (5 pts) (**Bonus**) Show that the derivative of  $f(x) = \sin x$  is  $f'(x) = \cos x$