

Math 150 Practice Test 1

1. For the function  $F$  graphed below, find:

a.  $\lim_{x \rightarrow 3^-} F(x)$

b.  $\lim_{x \rightarrow 3^+} F(x)$

c.  $\lim_{x \rightarrow 3} F(x)$

d.  $F(3)$

e.  $\lim_{x \rightarrow \infty} F(x)$

f.  $\lim_{x \rightarrow -\infty} F(x)$

2. For the function  $F$  in problem 1 above, find any discontinuities.

3. Find the limits:

a.  $\lim_{x \rightarrow -\infty} \frac{3x^3 - 4x}{2x^3 + 1}$

b.  $\lim_{x \rightarrow -2} \frac{x^3 + 8}{x + 2}$

c.  $\lim_{x \rightarrow 0^+} \pi$

d.  $\lim_{y \rightarrow 4} \frac{4 - y}{2 - \sqrt{y}}$

e.  $\lim_{x \rightarrow 3^-} \frac{2}{x - 3}$

4. Use the definition of the limit to prove that  $\lim_{x \rightarrow 5} (2x - 7) = 3$ .

5. Find the limits:

a.  $\lim_{x \rightarrow 0} \frac{\sin 3x}{\tan 7x}$

b.  $\lim_{x \rightarrow 0} \frac{2x + \sin x}{x}$

c.  $\lim_{x \rightarrow 0^+} \sin\left(\frac{1}{x}\right)$

d.  $\lim_{t \rightarrow 0} \frac{t}{\cos t}$

6. Find all points of discontinuity:  $f(x) = \frac{x+3}{|x^2+3x|}$ .

7. Let  $f(x) = x^2 - 1$ .

a. Find the slope of the secant line between the points on the graph of  $f$  for which  $x = 1$  and  $x = 2$ .

b. Use the definition of the derivative to find the slope of the tangent line to the graph of  $f$  at the point where  $x = 1$ .

c. Find an equation of the tangent line to the graph of  $f$  at the point where  $x = 1$ .

8. Use the definition of the derivative to find the derivative of  $f(x) = \frac{1}{x+1}$ .

9. Find  $\frac{dy}{dx}$  (and do not simplify!) if:

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

b.  $y = \left(x^4 - \frac{3}{x^2}\right)(x^2 - 2x + 1)$

c.  $y = \frac{x^2 - 2x}{4x - 3}$

d.  $y = \frac{1-x}{1+7\sqrt{x}}$