

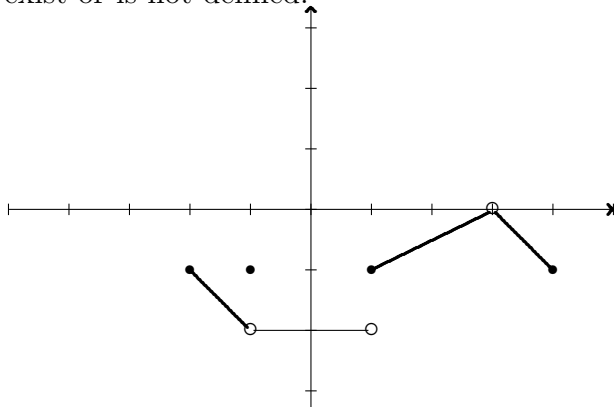
February 16, 2005

Name _____

The problems count as marked. The total number of points available is 165.

Throughout this test, **show your work.**

1. (18 points) Consider the function F whose graph is given below. Evaluate each of the following expressions. Note: Enter 'DNE' if the limit does not exist or is not defined.



(a) $\lim_{x \rightarrow -1^-} F(x) =$

(b) $\lim_{x \rightarrow -1^+} F(x) =$

(c) $\lim_{x \rightarrow -1} F(x) =$

(d) $F(-1) =$

(e) $\lim_{x \rightarrow 1^-} F(x) =$

(f) $\lim_{x \rightarrow 1^+} F(x) =$

(g) $\lim_{x \rightarrow 1} F(x) =$

(h) $\lim_{x \rightarrow 3} F(x) =$

(i) $F(3) =$

2. (6 points) Evaluate the limit

$$\lim_{x \rightarrow -9} \frac{x^2 + 10x + 9}{x + 9}$$

3. (6 points) Evaluate the limit

$$\lim_{x \rightarrow 3} \frac{x - 3}{x^2 + 4x - 21}$$

4. (6 points) Evaluate the limit

$$\lim_{x \rightarrow 1} \frac{x^3 - x}{x^2 - 1}$$

5. (6 points) Evaluate the limit

$$\lim_{t \rightarrow 4} \frac{4 - t}{2 - \sqrt{t}}$$

6. (6 points) Evaluate the limit

$$\lim_{x \rightarrow 8} \frac{\frac{1}{x} - \frac{1}{8}}{x - 8}$$

7. (12 points) Let

$$f(x) = \begin{cases} x + 1 & \text{if } x \leq -5 \\ 1 & \text{if } x > -5 \end{cases}$$

Sketch the graph of this function for yourself and find following limits if they exist (if not, enter DNE).

(a) $\lim_{x \rightarrow -5^-} f(x)$

(b) $\lim_{x \rightarrow -5^+} f(x)$

(c) $\lim_{x \rightarrow -5} f(x)$

8. (8 points) Find the midpoint of the segment joining $(4, 3)$ and $(-2, 7)$. Then find the distance from that midpoint to the origin $(0, 0)$.

9. (8 points) Let a polynomial be defined by $p(x) = (2x - 3)^3(x - 1)(3x + 5)^2$. What is the degree of p ? When p is written in standard form $a_nx^n + a_{n-1}x^{n-1} + \cdots + a_1x + a_0$ where $a_n \neq 0$, what is a_6 ? What is a_0 ?

10. (18 points) Let

$$f(x) = \begin{cases} 9 & \text{if } x < -5 \\ -x + 4 & \text{if } -5 \leq x < 2 \\ 0 & \text{if } x = 2 \\ 4 & \text{if } x > 2 \end{cases}$$

Sketch the graph of this function and find following limits if they exist (if not, enter DNE).

(a) $\lim_{x \rightarrow 2^-} f(x)$

(b) $\lim_{x \rightarrow 2^+} f(x)$

(c) $\lim_{x \rightarrow 2} f(x)$

(d) $\lim_{x \rightarrow -5^-} f(x)$

(e) $\lim_{x \rightarrow -5^+} f(x)$

(f) $\lim_{x \rightarrow -5} f(x)$

11. (12 points) Consider the function whose properties are displayed.

a	-1	0	1	2	3	4
$\lim_{x \rightarrow a^-} f(x)$	DNE	1	1	3	2	3
$\lim_{x \rightarrow a^+} f(x)$	1	1	1	3	2	DNE
$f(a)$	1	1	-1	3	2	3
$\lim_{x \rightarrow a^-} g(x)$	DNE	1	3	3	1	0
$\lim_{x \rightarrow a^+} g(x)$	1	2	3	3	1	DNE
$g(a)$	1	-1	3	3	1	0

Using the table above calculate the limits below. Enter 'DNE' if the limit doesn't exist OR if limit can't be determined from the information given.

(a) $\lim_{x \rightarrow 1^-} [f(x) + g(x)]$

(b) $f(1)g(1)$

(c) $f(0) + g(0)$

12. (6 points) Evaluate the limit

$$\lim_{x \rightarrow \infty} \frac{2 + 3x}{9 - 3x}$$

13. (6 points) Evaluate the limit

$$\lim_{x \rightarrow \infty} \frac{2x^3 - 10x^2 - 3x}{7 - 6x - 10x^3}$$

14. (8 points) Find the (implied) domain of

$$f(x) = \frac{\sqrt{x-5}}{(x-1)(x-9)},$$

and write your answer in interval notation.

15. (8 points) Find all the x -intercepts of the function

$$g(x) = 3(2x - 5)^3(2x + 1)^2 - 6(2x - 5)^2(2x + 1)^3.$$

16. (8 points) Find an equation for a line perpendicular to the line $2x - 4y = 7$ and which goes through the point $(-2, 4)$.

17. (8 points) Suppose $f(x) = \sqrt{2x - 1}$ and $g(x) = x^2 + 3$. Find the two composite functions

(a) $f \circ g(x)$

(b) $g \circ f(x)$

18. (15 points) Let $f(x) = x^2 - x$.

(a) Find the slope of the line joining the points $(3, 6)$ and $(x, f(x))$, where $x \neq 3$.

(b) Then find the limit of the expression in (a) as $x \rightarrow 3$. Call this limit $f'(3)$.

(c) Use the information found in (b) to write an equation for the line tangent to the graph of f at the point $(3, 6)$.