

## Intro to Calculus - Midterm Review #2

Solve and graph the solution for each of the following.

1.  $|2x - 5| \geq 9$

2.  $|3x + 4| < 10$

3.  $\frac{x+4}{2} \leq \frac{3x-1}{4} + 2$

4.  $x^3 + 2x^2 \geq 8x$

Find the domain for each of the following:

5.  $f(x) = \frac{x-4}{x+5}$

6.  $g(x) = \sqrt{2x+7}$

7.  $g(x) = \sqrt{x^2 - x - 12}$

If  $f(x) = 3x + 2$  and  $g(x) = x^2 - 4$ , find each of the following.

8.  $f(x) + g(x)$

9.  $f(g(x))$

10.  $g(f(1))$

11.  $f^{-1}(x)$

12. Find the formula for  $t_n$  for the sequence 10, 7, 4, 1, ...

13. Find the formula for  $t_n$  for the sequence 40, -20, 10, -5, ...
14. Find  $t_{100}$  in the arithmetic sequence in which  $t_1 = 52$  and  $t_4 = 40$ .
15. Find  $t_8$  in the geometric sequence in which  $t_1 = 64$  and  $t_2 = 32$ .
16. How many terms are in the arithmetic sequence 305, 295, ..., 5?
17. How many three-digit numbers are divisible by 8?
18. Find the sixth term of the sequence if  $t_1 = 2$  and  $t_n = 3t_{n-1} + 1$ .
19. Find  $S_{20}$  of the arithmetic series  $12 + 18 + 24 + \dots$

20. Find  $S_8$  of the geometric series  $5 - 15 + 45 - \dots$

21. Find the sum of the infinite geometric series  $12 - 8 + 16/3 - \dots$

Find the following limits.

$$22. \lim_{n \rightarrow \infty} \frac{7n^2 - 3}{2n^2 + 5}$$

$$23. \lim_{n \rightarrow \infty} \frac{4n^3 - 1}{n^2 + 5}$$

$$24. \lim_{n \rightarrow \infty} \frac{5n - 2}{3n^2 + 1}$$

$$25. \lim_{n \rightarrow \infty} 1 + \frac{6}{n}$$

$$26. \lim_{x \rightarrow 1} \frac{x + 4}{2x^2 + 9x - 5}$$

$$27. \lim_{x \rightarrow 3} \frac{2x^2 - 9x + 9}{3x^2 - 27}$$

$$28. \lim_{x \rightarrow 0} \frac{2x}{3 - \sqrt{9 - x}}$$

$$29. \lim_{x \rightarrow 4} \frac{x^2 - 16}{x - 4}$$

Find  $f'(x)$  for each of the following.

$$30. f(x) = 5x^4 - 3x^3 + 2x - 7$$

$$31. f(x) = \frac{4x^3 - 1}{x^2}$$

$$32. f(x) = 3\sqrt{x} - \pi^2$$

33. Write the equation of a line tangent to  $f(x) = 4x^2 - 3$  at  $x = 2$ .

34. Given  $g(x) = \frac{x^2 - 9}{x^2 - 3x}$ , find the following.

- State the discontinuities \_\_\_\_\_
- What type are the discontinuities? \_\_\_\_\_
- x-intercept(s) \_\_\_\_\_
- y-intercept \_\_\_\_\_
- coordinates of a hole (if there is one) \_\_\_\_\_
- vertical asymptote (if there is one) \_\_\_\_\_
- horizontal asymptote \_\_\_\_\_
- Sketch the graph

35. Use the definition of the derivative to find  $f'(x)$  of  $f(x) = x^2 + 4x - 1$ .

For #36 – 37 find the following:

- Find the first derivative and the zeros of the first derivative.
- List the intervals where the function is increasing or decreasing.
- Find the coordinates of any local maximum(s) or minimum(s).
- Plot the y-intercept.
- Sketch the graph.

36.  $f(x) = x^3 - 6x^2 + 5$

37.  $f(x) = 3x^3 - 9x$