AP Calculus BC 2023-2024 Summer Assignments

Below is a list of assignment in Delta Math that you need to be complete and prepared to submit in Schoology (screenshot of your score) on the first day of school. You will need to join my class in Delta Math(see direction below) to complete these assignments. I realize that you may need some help with these problems, and I am willing to answer your questions through email or through Schoology. Therefore, you will need to attempt these problems before the last week of July since I will be involved with pre-planning activities the week of July 24th and will have limited availability. sims.beth@fcboe.org

*** Please neatly work the problems on separate sheets of paper, FRONT ONLY. Each problem should include all your work along with your solutions. When necessary, you need to write a statement of the thought process by which you found your answer. To submit an assignment on Schoology you will need to take picture as a pdf or jpeg, personally I recommend the app Camscanner. This app can be linked to your FCBOE Google drive account.

Next year AP Calculus students will be using the TI-89 calculators or TI-Nspire CX CAS. We have a limited supply of TI-Nspire CX CAS to issue out to students for them to use during the school year. However, if you want to buy your own, you may be able to find a good used one on eBay. You will also want to keep your TI-84 on hand for other calculations.

Create an account in DeltaMath.com
Go the DeltaMath.com, click "Create Account" then type in my teacher code 169873. Use your fcboe.org email as your username(email) and choose a password. They type in your first and last name. Then select our class (AP Calculus BC 2023-2024) from the dropdown menu.

Complete the following assignments:

Various Topics	✔
Logarithmic Properties	✔
Logarithmic Equations	✔
Trigonometry - Exact Radian Values	✔
Trigonometry Solving with Radians	✔
Polar Coordinates	✔
Limits From a Table and Graph	✔
Analytical Limits	✔

GroupMe QR Code

Now is the time to start forming study groups.
GroupMe Web Address:

https://groupme.com/join_group/94226160/SbLuMgbR

Timeline for the first test in Calculus

Summer: You will work to complete this assignment pages 2-9, and the DeltaMath assignments. Do not wait until August 1st to start this work.

August 3th (day 1): You will take the first portion of the test; this will be over the Unit Circle in which you will be REQUIRED to have the Unit Circle memorized and be able to answer trigonometric value questions and inverse trigonometric value questions based on the Unit Circle. You are REQUIRED to have the following identities memorized: Reciprocal, Quotient, Pythagoreans, Double Angle and Power Reducing. This will be worth 25 points.

August 3th (day 1): You will be required to submit in Schoology the DeltaMath assignments. Your score will be determined by <u>accuracy</u> and completion. This will be worth 25 points. You will lose 5 points per day for every day it is late.

August 4th – August 15th (day 2 - day 9): We will cover new material about Limits and Continuity in terms of Calculus and answer questions about the summer work assignments.

August 16th (day 10): You will take a test over the summer work and about Limits and Continuity in terms of Calculus. The test will consist of calculator and no calculator questions. This will be worth 50 pts.

Together all these parts make for the first 100 point test.

BC Calculus Summer Work: No Calculator!

Students are REQUIRED to know the Unit Circle. Students will be expected to answer questions without creating a Unit Circle. Students are REQUIRED to know the quadrant each angle is located before stating the exact value of each trigonometric expression.

Examples of Unit Circle Questions

1. $\sin\left(\frac{\pi}{6}\right)$
2. $\cos\left(\frac{-31\pi}{6}\right)$
3. $\tan\left(\frac{11\pi}{3}\right)$
4. $\sec\left(\frac{7\pi}{6}\right)$
5. $\csc(12\pi)$

6. $\sin\left(\frac{5\pi}{4}\right)$
7. $\cos\left(\frac{15\pi}{4}\right)$
8. $\tan\left(-\frac{4\pi}{3}\right)$
9. $\sec\left(-\frac{\pi}{6}\right)$
10. $\csc\left(-\frac{15\pi}{2}\right)$

11. $\cot\left(-\frac{5\pi}{6}\right)$
12. $\cot\left(\frac{-31\pi}{4}\right)$
13. $\tan\left(\frac{11\pi}{4}\right)$
14. $\sec\left(\frac{17\pi}{3}\right)$
15. $\csc\left(-\frac{5\pi}{4}\right)$

Students are REQUIRED to know Inverse Trigonometry related to the Unit Circle and non-Unit Circle values.

Examples of Inverse Trigonometry Questions

16. What is the domain of $\sin^{-1}(x)$?
17. What is the range of $\sin^{-1}(x)$?
18. What is the domain of $\cos^{-1}(x)$?
19. What is the range of $\cos^{-1}(x)$?
20. What is the domain of $\tan^{-1}(x)$?
21. What is the range of $\tan^{-1}(x)$?

22. $\cos^{-1}\left(-\frac{1}{2}\right)$ 23. $\tan^{-1}\left(-\frac{\sqrt{3}}{3}\right)$ 24. $\sin^{-1}(-1)$ 25. $\csc^{-1}(\sqrt{2})$ 26. $\sec^{-1}(-1)$

27. $\cot\left(\sin^{-1}\left(-\frac{1}{2}\right)\right)$
28. $\sec(\cot^{-1}(-1))$

29. $\cos\left(\sin^{-1}\left(\frac{4}{5}\right)\right)$
30. $\tan\left(\sec^{-1}\left(\frac{12}{5}\right)\right)$

31. $\tan(\cos^{-1}(x))$
32. $\sin(\csc^{-1}(x))$

Students are REQUIRED to have the following identities memorized: Reciprocal, Quotient, Pythagorean, Double Angle (for Sine and Cosine only) and Power Reducing (for Sine and Cosine only).

Examples of Identities Questions

33. State the Pythagorean Identity with Sine and Cosine. Show how this identity can be manipulated to create the Pythagorean Identity with Tangent and Secant.
34. State the Double Angle Identity Cosine. Show how this identity can be manipulated to create the other two Double Angle Identities for Cosine.

Students are REQUIRED to know the following functions and all their properties: Square Root, Sine, Parabola, Natural Log, Inverse Square, Logistic, Identity, Inverse, Exponential, Cubic, Cube Root Squared, Absolute Value, Cube Root and Cosine. See BC Calculus SW Functions to Know 2020 (p.3)

Examples of Functions Questions

35. List all the functions that increase on their entire domain.
36. List all the functions in which $\lim\limits_{x \to 0^+} f(x) \neq 0$
37. List all the functions in which $\lim\limits_{x \to \infty} f(x) = \infty$

Students are REQUIRED to know how to factor/solve polynomials using methods such as Greatest Common Factor, Grouping, Sum and Difference of two Cubes, Difference of Two Squares, and all Trinomials. Remember the Quadratic Formula can be used for trinomials that are equal to 0.

Examples of Factoring Questions

38. $125x^2 - 45$
39. $5x^2 + 17x + 6$
40. $2\cos^2 x + \cos x - 1$

Examples of Solving Questions

41. $xe^x + 3e^x = 0$
42. $12x^2 - 7x = -1$
43. $4\sin^4(x)\cos(x) - 5\sin^2(x)\cos(x) + \cos(x) = 0$

Functions to Know for Calculus

Power Functions. All functions in the form of $f(x) = x^n$.

1. $f(x) = x$
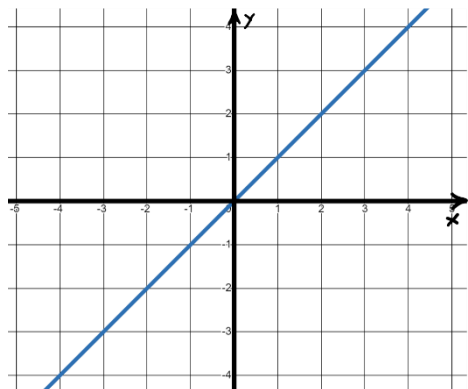
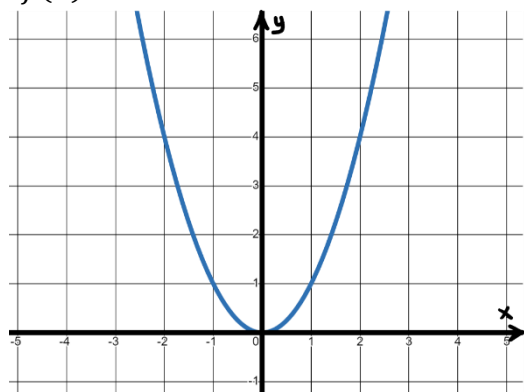The Identity Function

Domain:

Range:

Boundedness:

Even/Odd:

End Behavior:
$$\lim_{x \to \infty} f(x) = \underline{\qquad}$$

$$\lim_{x \to -\infty} f(x) = \underline{\qquad}$$

2. $f(x) = x^2$

The Quadratic Function aka Parabola

Domain:

Range:

Boundedness:

Even/Odd:
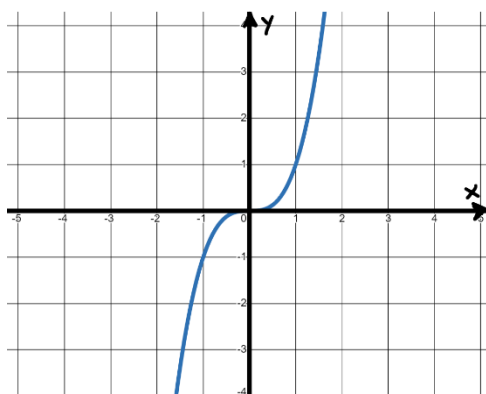
End Behavior:
$$\lim_{x \to \infty} f(x) = \underline{\qquad}$$

$$\lim_{x \to -\infty} f(x) = \underline{\qquad}$$

3. $f(x) = x^3$

The Cubic Function

Domain:

Range:

Boundedness:

Even/Odd:

End Behavior:
$$\lim_{x \to \infty} f(x) = \underline{\qquad}$$

$$\lim_{x \to -\infty} f(x) = \underline{\qquad}$$

4. $f(x) = \frac{1}{x}$ or x^{-1}
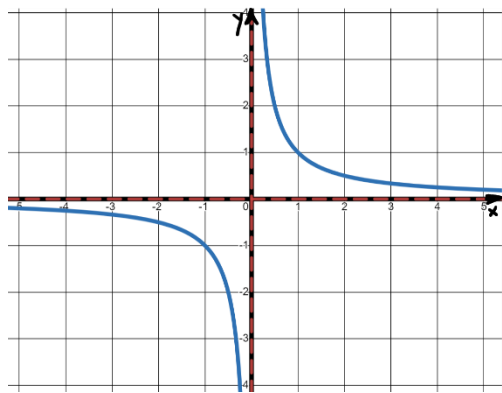
The Inverse Function

Domain:

Range:

Asymptote(s):

Boundedness:

Even/Odd:

End Behavior:
$$\lim_{x\to\infty} f(x) = \underline{\qquad}$$

$$\lim_{x\to-\infty} f(x) = \underline{\qquad}$$

5. $f(x) = \frac{1}{x^2}$ or x^{-2}
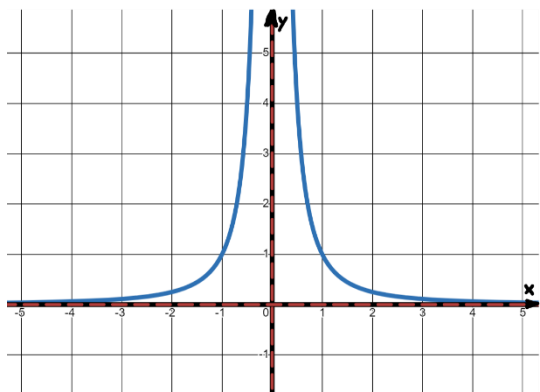
The Inverse Square Function aka The Trumpet
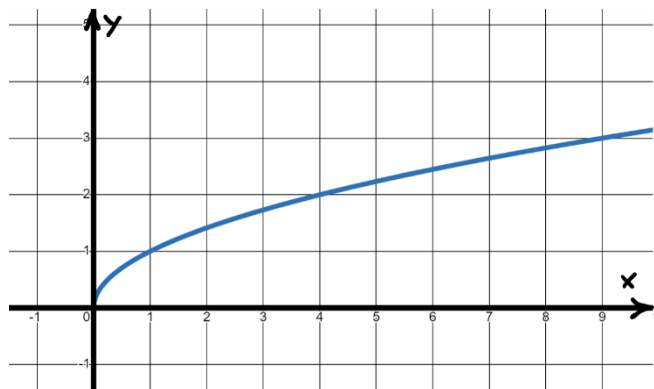
Domain:

Range:

Asymptote(s):

Boundedness:

Even/Odd:

End Behavior:
$$\lim_{x\to\infty} f(x) = \underline{\qquad}$$

$$\lim_{x\to-\infty} f(x) = \underline{\qquad}$$

6. $f(x) = \sqrt{x}$ or $x^{\frac{1}{2}}$
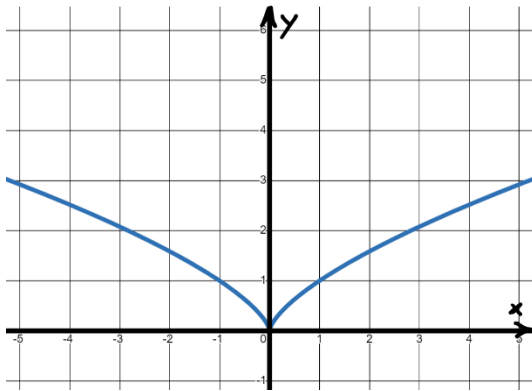

The Square Root Function

Domain:

Range:

Boundedness:

Even/Odd:

End Behavior:
$$\lim_{x\to\infty} f(x) = \underline{\qquad}$$

$$\lim_{x\to-\infty} f(x) = \underline{\qquad}$$

7. $f(x) = \sqrt[3]{x}$ or $x^{\frac{1}{3}}$
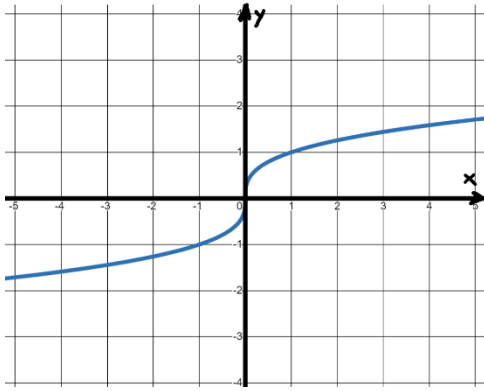
The Cube Root Function

Domain:

Range:

Boundedness:

Even/Odd:

End Behavior:

$\lim\limits_{x \to \infty} f(x) =$ _____

$\lim\limits_{x \to -\infty} f(x) =$ _____

8. $f(x) = \sqrt[3]{x^2}$ or $x^{\frac{2}{3}}$

The Cube Root Squared Function aka The Bird

Domain:

Range:

Boundedness:

Even/Odd:

End Behavior:
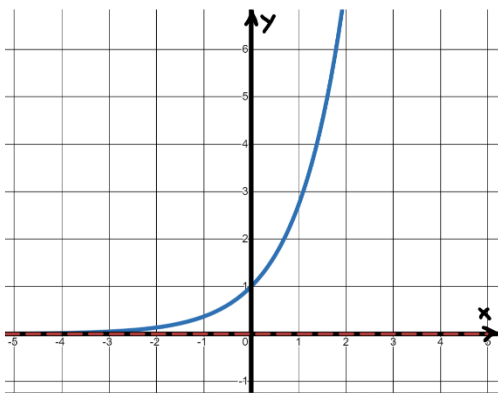
$\lim\limits_{x \to \infty} f(x) =$ _____

$\lim\limits_{x \to -\infty} f(x) =$ _____

Non-Power Functions

9. $f(x) = e^x$

The Exponential Function

Domain:

Range:

Asymptote(s):

Boundedness:

Even/Odd:

End Behavior:

$\lim\limits_{x \to \infty} f(x) =$ _____

$\lim\limits_{x \to -\infty} f(x) =$ _____

10. $f(x) = \frac{M}{1+Ae^{-(Mk)x}}$
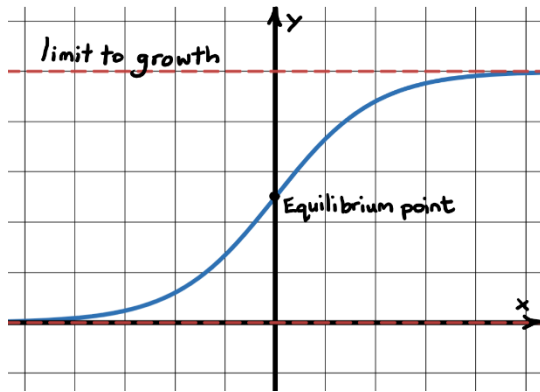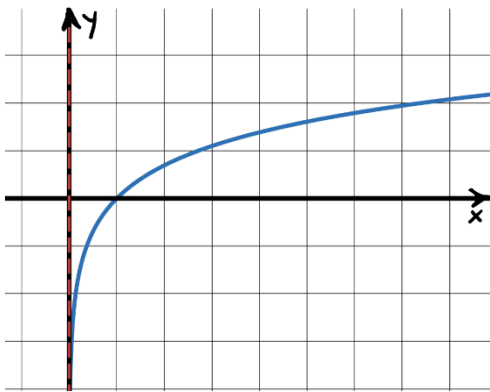
The Logistic Function

Domain:

Range:

Asymptote(s):

Boundedness:

Even/Odd:

End Behavior:
$$\lim_{x \to \infty} f(x) = \underline{\hspace{1cm}}$$

$$\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$$

11. $f(x) = \ln(x)$

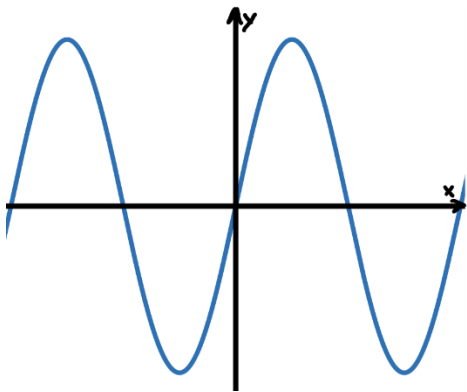The Logarithmic Function

Domain:

Range:

Asymptote(s):

Boundedness:

Even/Odd:

End Behavior:
$$\lim_{x \to \infty} f(x) = \underline{\hspace{1cm}}$$

$$\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$$

12. $f(x) = \sin(x)$

The Sine Function

Domain:

Range:

Boundedness:

Even/Odd:

End Behavior:
$$\lim_{x \to \infty} f(x) = \underline{\hspace{1cm}}$$

$$\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$$

13. $f(x) = \cos(x)$
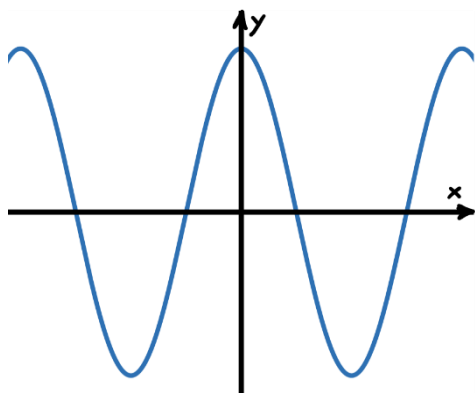
The Cosine Function

Domain:

Range:

Boundedness:

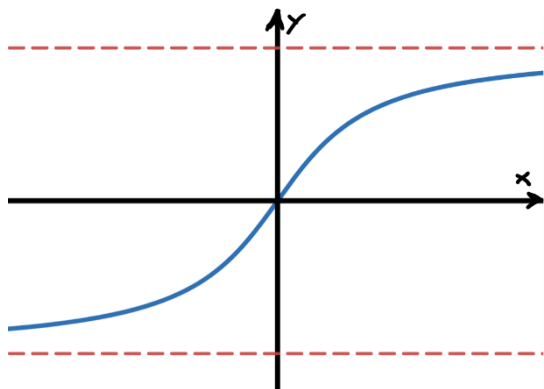Even/Odd:

End Behavior:
$$\lim_{x \to \infty} f(x) = \underline{\hspace{1cm}}$$

$$\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$$

14. $f(x) = \tan^{-1}(x)$

The Inverse Tangent Function

Domain:

Range:

Asymptote(s):

Boundedness:

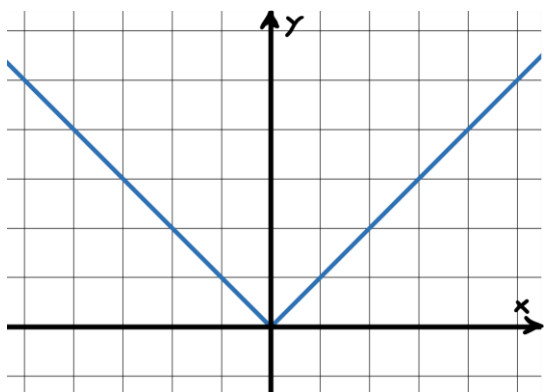Even/Odd:

End Behavior:
$$\lim_{x \to \infty} f(x) = \underline{\hspace{1cm}}$$
$$\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$$

15. $f(x) = |x|$ or $\begin{cases} -x \ for \ x < 0 \\ x \ for \ x \geq 0 \end{cases}$

The Absolute Value Function

Domain:

Range:

Boundedness:

Even/Odd:
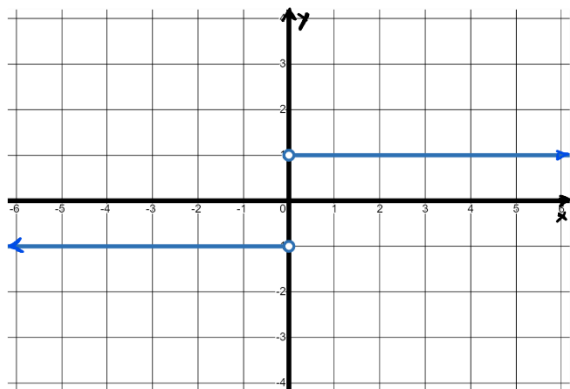
End Behavior:
$$\lim_{x \to \infty} f(x) = \underline{\hspace{1cm}}$$

$$\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$$

16. $f(x) = \dfrac{x}{|x|}$ or $\dfrac{|x|}{x}$

Domain:

Range:

Boundedness:

Even/Odd:

End Behavior:
$$\lim_{x \to \infty} f(x) = \underline{\hspace{1cm}}$$
$$\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$$

Known End-Behaviors

1. $f(x) = e^{-x}$ $\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$ $\lim_{x \to +\infty} f(x) = \underline{\hspace{1cm}}$

2. $f(x) = b^{-x}, \text{ if } b > 1$ $\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$ $\lim_{x \to +\infty} f(x) = \underline{\hspace{1cm}}$

3. $f(x) = a \cdot \tan^{-1}(x)$ $\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$ $\lim_{x \to +\infty} f(x) = \underline{\hspace{1cm}}$

4. $f(x) = \dfrac{M}{1 + Ae^{-(Mk)x}}$ $\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$ $\lim_{x \to +\infty} f(x) = \underline{\hspace{1cm}}$

5. $f(x) = \dfrac{p \cdot x^n}{q \cdot x^{n+\#}}$ $\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$ $\lim_{x \to +\infty} f(x) = \underline{\hspace{1cm}}$

6. $f(x) = \dfrac{p \cdot x^{n+\#}}{q \cdot x^n}$ $\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$ $\lim_{x \to +\infty} f(x) = \underline{\hspace{1cm}}$

7. $f(x) = \dfrac{p \cdot x^n}{q \cdot x^n}$ $\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$ $\lim_{x \to +\infty} f(x) = \underline{\hspace{1cm}}$

8. $f(x) = \dfrac{a \cdot |x|}{x}$ $\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$ $\lim_{x \to +\infty} f(x) = \underline{\hspace{1cm}}$

9. $f(x) = p \cdot x^n$ $n = even, p > 0$ $\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$ $\lim_{x \to +\infty} f(x) = \underline{\hspace{1cm}}$

10. $f(x) = p \cdot x^n$ $n = even, p < 0$ $\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$ $\lim_{x \to +\infty} f(x) = \underline{\hspace{1cm}}$

11. $f(x) = p \cdot x^n$ $n = odd, p > 0$ $\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$ $\lim_{x \to +\infty} f(x) = \underline{\hspace{1cm}}$

12. $f(x) = p \cdot x^n$ $n = odd, p < 0$ $\lim_{x \to -\infty} f(x) = \underline{\hspace{1cm}}$ $\lim_{x \to +\infty} f(x) = \underline{\hspace{1cm}}$