

Summer Assignment DE Calculus I or I/II, Ertan KAYA 2022

- 1) You may use reference materials to complete this assignment.**
- 2) The assignment covers material you must know to be successful in Calculus.**
- 3) Please take the assignment seriously.**
- 4) The assignment is due the 1st Monday of the Academic Year 2022/2023**
- 5) The Assignment will be used as a Quiz Grade.**
- 6) Please email at ertan.kaya@apsva.us should you have any questions.**

I. Functions and Relations: Domain

I. Find the domain. Write the solution in set notation.

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

2) $f(x) = x^3 - 4x + 3$

3) $g(x) = \frac{3}{x-4}$

4) $h(x) = \frac{3}{x^2+12}$

5) $p(x) = \frac{3}{x^2+4x-12}$

6) $d(x) = \frac{2x-3}{2x^2+7x-15}$

7) $d(x) = \frac{\sqrt{3+5x}}{7x^2-35x-14}$

8) $d(x) = \frac{\sqrt{4-9x}}{x}$

9) $f(x) = \frac{x^3-27}{x^2-3x-18}$

10) $f(x) = \frac{x^2-4x+7}{4x^3-32}$

II. Functions: Arithmetic, Composition and Inverse Functions

Find the indicated.

$$f(x) = 3x - 2$$

$$g(x) = x^2 - 3x - 28$$

$$h(x) = \frac{1}{x}$$

- 1) Evaluate $f(4) + -3g(-3)$
- 2) Evaluate $5f(0) + h(-2)$
- 3) Evaluate $g(x + h)$
- 4) Evaluate $f\left(\frac{2}{x}\right)$
- 5) Evaluate $\frac{g(x)}{f(-2x)}$
- 6) Find $f(g(x))$ and its domain
- 7) $g(f(x))$
- 8) $h(g(x))$
- 9) $g(h(x))$
- 10) $f(g(x - 1))$
- 11) $g(f(x + 2))$

For each of the following, find the difference quotient. The difference quotient is given by:

$$\frac{f(x + h) - f(x)}{h}$$

- 12) $f(x) = 3x - 2$
- 13) $g(x) = x^2 - 3x - 28$
- 14) $h(x) = \frac{1}{x}$
- 15) $k(x) = \sqrt{x + 4}$

Find the inverse of each of the

16) $g(x) = 2x + 5$

17) $h(x) = \frac{3}{x-4}$

18) $m(x) = \sqrt[3]{x+7}$

19) $f(x) = x^3 - 1$

20) $f(x) = x^2 - 1$ for $x \geq 1$

III. Asymptotes, End behavior of Rational Functions Solving Quadratic Equations

For each of the following, find the indicated.

Function	Find or complete. If not possible, write N/A
1) $h(x) = \frac{3}{x-4}$	<ul style="list-style-type: none"> ✓ The Vertical asymptote ✓ The horizontal asymptote ✓ The Slant Asymptote ✓ As $x \rightarrow -\infty$, $y \rightarrow ?$ and As $x \rightarrow \infty$, $y \rightarrow ?$ ✓ As $x \rightarrow 4^-$, $y \rightarrow ?$ and As $x \rightarrow 4^+$, $y \rightarrow ?$ ✓ The x-intercept/s ✓ The y-intercept/s

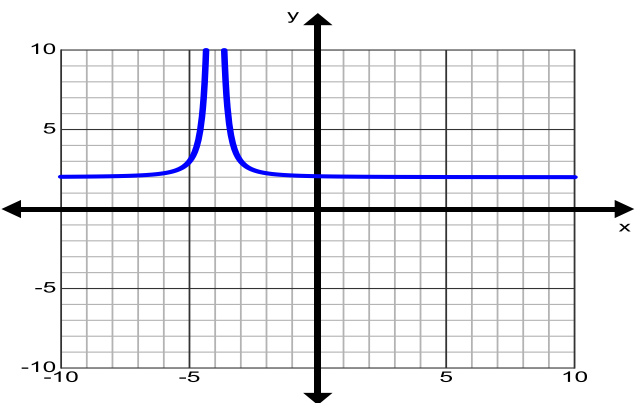
Function	Find or complete. If not possible, write N/A
2) $h(x) = \frac{x^2}{x^2 - 9}$	<ul style="list-style-type: none"> ✓ The Vertical asymptote ✓ The horizontal asymptote ✓ The Slant Asymptote ✓ As $x \rightarrow -\infty$, $y \rightarrow ?$ and As $x \rightarrow \infty$, $y \rightarrow ?$ ✓ As $x \rightarrow 3^-$, $y \rightarrow ?$ and As $x \rightarrow 3^+$, $y \rightarrow ?$ ✓ As $x \rightarrow -3^-$, $y \rightarrow ?$ and As $x \rightarrow -3^+$, $y \rightarrow ?$ ✓ The x-intercept/s ✓ The y-intercept/s
Function	Find or complete. If not possible, write N/A

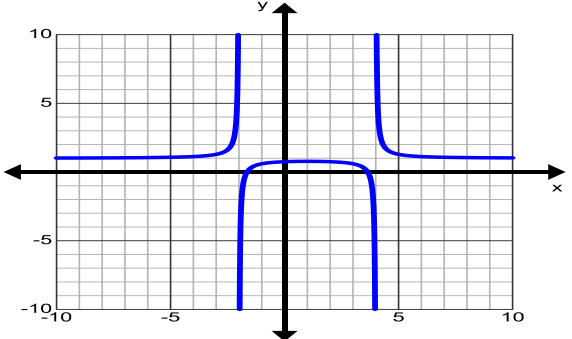
3) $f(x) = \frac{x-1}{x^2+x-2}$	<ul style="list-style-type: none"> ✓ The Vertical asymptote ✓ The horizontal asymptote ✓ The Slant Asymptote ✓ As $x \rightarrow -\infty, y \rightarrow ?$ and As $x \rightarrow \infty, y \rightarrow ?$ ✓ As $x \rightarrow 2^-, y \rightarrow ?$ and As $x \rightarrow 2^+, y \rightarrow ?$ ✓ The x-intercept/s ✓ The y-intercept/s
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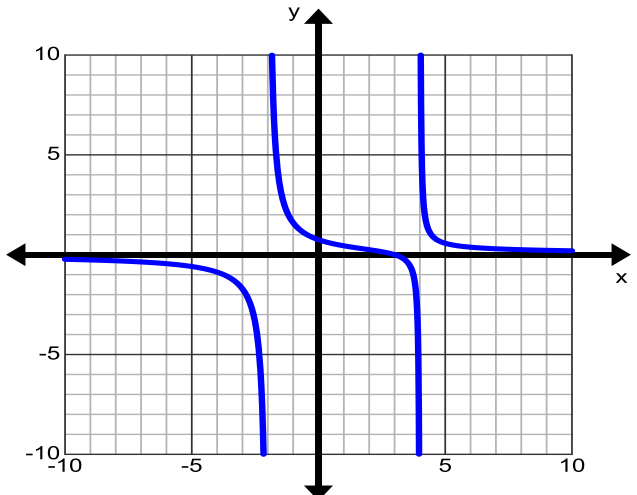
Function	Find or complete. If not possible, write N/A
4) $g(x) = \frac{5+x}{x^2(1-x)}$	<ul style="list-style-type: none"> ✓ The Vertical asymptote ✓ The horizontal asymptote ✓ The Slant Asymptote ✓ As $x \rightarrow -\infty, y \rightarrow ?$ and As $x \rightarrow \infty, y \rightarrow ?$ ✓ As $x \rightarrow 1^-, y \rightarrow ?$ and As $x \rightarrow 1^+, y \rightarrow ?$ ✓ As $x \rightarrow 0^-, y \rightarrow ?$ and As $x \rightarrow 0^+, y \rightarrow ?$ ✓ The x-intercept/s ✓ The y-intercept/s

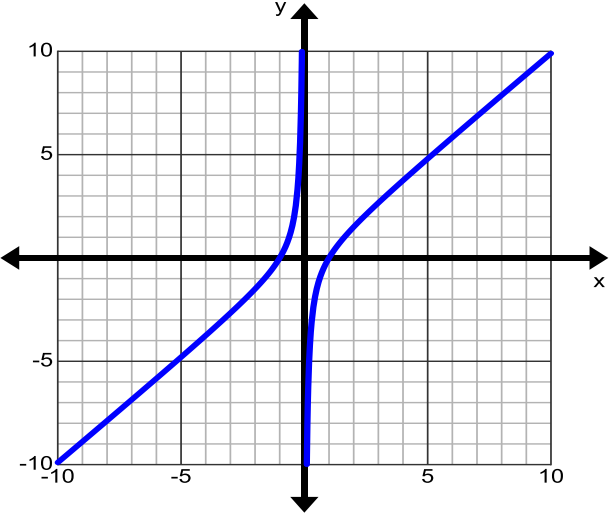
Function	Find or complete. If not possible, write N/A
5) $g(x) = \frac{6-x}{x^2-36}$	<ul style="list-style-type: none"> ✓ The Vertical asymptote ✓ The horizontal asymptote ✓ The Slant Asymptote ✓ As $x \rightarrow -\infty, y \rightarrow ?$ and As $x \rightarrow \infty, y \rightarrow ?$ ✓ As $x \rightarrow -6^-, y \rightarrow ?$ and As $x \rightarrow -6^+, y \rightarrow ?$ ✓ The x-intercept/s ✓ The y-intercept/s

Function	Find or complete. If not possible, write N/A
6) $f(x) = \frac{3x^2}{5x^2 - 7}$	<ul style="list-style-type: none"> ✓ The Vertical asymptote ✓ The horizontal asymptote ✓ The Slant Asymptote ✓ As $x \rightarrow -\infty$, $y \rightarrow ?$ and As $x \rightarrow \infty$, $y \rightarrow ?$ ✓ As $x \rightarrow \frac{5\sqrt{7}^-}{5}$, $y \rightarrow ?$ and As $x \rightarrow \frac{5\sqrt{7}^+}{5}$, $y \rightarrow ?$ ✓ As $x \rightarrow -\frac{5\sqrt{7}^-}{5}$, $y \rightarrow ?$ and As $x \rightarrow -\frac{5\sqrt{7}^+}{5}$, $y \rightarrow ?$ ✓ The x-intercept/s ✓ The y-intercept/s

Function	Find or complete. If not possible, write N/A
7) 	<ul style="list-style-type: none"> ✓ The Vertical asymptote ✓ The horizontal asymptote ✓ The Slant Asymptote ✓ As $x \rightarrow -\infty$, $y \rightarrow ?$ and As $x \rightarrow \infty$, $y \rightarrow ?$ ✓ As $x \rightarrow -4^-$, $y \rightarrow ?$ and As $x \rightarrow -4^+$, $y \rightarrow ?$ ✓ The x-intercept/s ✓ The y-intercept/s

Function	Find or complete. If not possible, write N/A
<p>8)</p> 	<ul style="list-style-type: none"> ✓ The Vertical asymptote ✓ The horizontal asymptote ✓ The Slant Asymptote ✓ As $x \rightarrow -\infty$, $y \rightarrow ?$ and As $x \rightarrow \infty$, $y \rightarrow ?$ ✓ As $x \rightarrow 4^-$, $y \rightarrow ?$ and As $x \rightarrow 4^+$, $y \rightarrow ?$ ✓ As $x \rightarrow -2^-$, $y \rightarrow ?$ and As $x \rightarrow -2^+$, $y \rightarrow ?$ ✓ The x-intercept/s ✓ The y-intercept/s

Function	Find or complete. If not possible, write N/A
<p>9)</p> 	<ul style="list-style-type: none"> ✓ The Vertical asymptote ✓ The horizontal asymptote ✓ The Slant Asymptote ✓ As $x \rightarrow -\infty$, $y \rightarrow ?$ and As $x \rightarrow \infty$, $y \rightarrow ?$ ✓ As $x \rightarrow 4^-$, $y \rightarrow ?$ and As $x \rightarrow 4^+$, $y \rightarrow ?$ ✓ As $x \rightarrow -2^-$, $y \rightarrow ?$ and As $x \rightarrow -2^+$, $y \rightarrow ?$ ✓ The x-intercept/s ✓ The y-intercept/s

Function	Find or complete. If not possible, write N/A
<p>10)</p> 	<ul style="list-style-type: none"> ✓ The Vertical asymptote ✓ The horizontal asymptote ✓ The Slant Asymptote ✓ As $x \rightarrow -\infty$, $y \rightarrow ?$ and As $x \rightarrow \infty$, $y \rightarrow ?$ ✓ As $x \rightarrow 0^-$, $y \rightarrow ?$ and As $x \rightarrow 0^+$, $y \rightarrow ?$ ✓ The x-intercept/s ✓ The y-intercept/s

IV. Logarithms

Use the properties of logarithms to evaluate each of the following without the use of a calculator.

- 1) $\log_8 1$
- 2) $\log_2 \frac{1}{8}$
- 3) $\log_6 36$
- 4) $\log_4 8$
- 5) $\ln \sqrt{e}$
- 6) $\log_3 3^7$
- 7) $\log_4 \sqrt[5]{16}$
- 8) $8 \ln e^4$

Use the properties of logarithms to expand each of the following with only linear factors.

9) $\log_3 x\sqrt{y}$

10) $\log_7 \frac{x+5}{x-3}$

11) $\log_2 \frac{x^2 + 11x + 30}{x+4}$

12) $\log_3 \sqrt[5]{\frac{x^2 + 10x + 25}{x(x+4)}}$

13) $\log_6 \frac{\sqrt[7]{x^2 - 4}}{(x+6)^{\frac{3}{5}}}$

14) $\log_b \frac{\sqrt{x^3(x+3)}}{x-1}$

15) $\ln_3 \sqrt[3]{\frac{x^5}{(x+4)(x-2)}}$

V. Trigonometry

Evaluate. Find the exact value. Do not use a calculator. Use special triangles and the concept of Reference angles.

1) $\sin \frac{7}{2}\pi - \tan \frac{\pi}{4}$

2) $\cos \pi - \sin \frac{15}{2}\pi$

3) $\cos 60^\circ - \sin 30^\circ$

4) $\cos 60^\circ + \sin 30^\circ$

5) $\tan \frac{\pi}{3}$

6) $\sin\left(-\frac{\pi}{6}\right)$

7) $\cos\left(-\frac{4\pi}{3}\right)$

8) $\cot\left(\frac{11\pi}{4}\right)$

9) $\cot\left(\frac{11\pi}{4}\right) - \tan\left(\frac{3}{4}\pi\right)$

Complete each of the following using trigonometric identities and formulas.

10) $\sin\left(\frac{\pi}{2} - x\right)$

11) $\cos\left(-\frac{\pi}{6}\right)$

12) $\tan 2u$

Solve the equations. Find all solution on $[0, 2\pi)$ and the expression for the general solution.

13) $2\sin x - 1 = 0$

14) $2\cos x + \sqrt{3} = 0$

15) $4\tan^2 x - 12 = 0$

16) $2\cos^2 x - 1 - \cos = 0$

VI. Sequences and Series

Find the indicated term of the given sequence.

1) Write the explicit expression of the sequence and find the 12th term of

$$15, 19, 23, 27, \dots$$

2) Write the explicit expression of the sequence and find the 10th term of

$$9, 3, 1, \frac{1}{3}, \dots$$

3) Write the explicit expression of the sequence and find the 8th term of

$$5, -25, 125, -625, \dots$$

4) Write the explicit expression of the sequence and find the 11th term of

$$34, 28, 22, 16, \dots$$

5) Write the explicit expression of the sequence and find the 8th term of

$$0.75, 3, 12, 48, \dots$$

6) Evaluate $-3 + 15 + -75 + 375 + \dots$, for $n = 9$

7) Given an arithmetic series with $a_1 = -7$ and $d = -5$, evaluate for $n = 9$.

8) Given an arithmetic series with $a_1 = 14$ and $a_n = 86$ evaluate for $n = 15$.

9) Evaluate $\sum_{n=1}^{n=12} \left(-2 + \frac{4}{3}n \right)$

10) Evaluate the geometric series $-9, \frac{18}{5}, -\frac{36}{25}, \frac{72}{125}, \dots$ for $n = 8$

11) Evaluate $-16, 4, -1, \frac{1}{4}, \dots$

12) Evaluate $12, 24, 48, 96, \dots$

13) Evaluate $\sum_{n=1}^{\infty} \left(\frac{1}{5} \right)^{n-1}$

14) Evaluate $\sum_{n=1}^{\infty} \left(-\frac{3}{5} \right)^{n-1}$

15) Evaluate $\sum_{n=1}^{\infty} (-2)^{n-1}$