Problem 1. **(10 points)**

Consider the function $f(x) = \dfrac{3x+10}{6-5x}$.

a. The function $f(x) = \dfrac{3x+10}{6-5x}$ has a root at $x =$ ☐.

b. The function $f(x) = \dfrac{3x+10}{6-5x}$ has a vertical asymptote at $x =$ ☐.

c. Use interval notation to represent the three separate intervals where $f(x) = \dfrac{3x+10}{6-5x}$ will be **defined** and **non-zero**: ☐

d. The inequality $\dfrac{3x+10}{6-5x} \geq 0$ has solutions on the interval(s) $S =$ ☐.

- Use exact forms (such as fractions) instead of decimal approximations.
- Type “inf” and “-inf” for ∞ and $-\infty$, respectively.
- Type the capital letter “U” to represent the union symbol $\cup$.

Note: *You can earn partial credit on this problem.*

preview answers

Problem 2. **(10 points)**

For the rational function $f(x) = -\dfrac{(x+5)(x-2)}{(x+6)(x+4)}$.

a. Find the vertical asymptote(s):

Note: If more than one, use commas to separate your answers

$x =$ ☐

b. Find the x-intercept(s) and input as numbers:

Note: If more than one, use commas to separate your answers

$x =$ ☐

c. Find the horizontal asymptote:

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Note: If there is no horizontal asymptote, enter 'none'

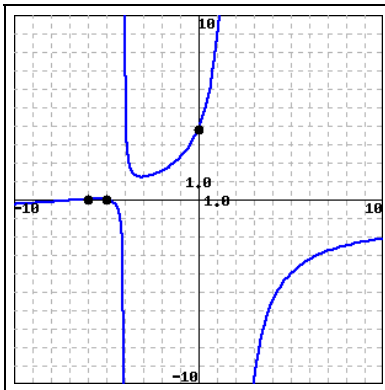
$y =$ ☐

d. Find the y-intercept(s) and input as numbers:

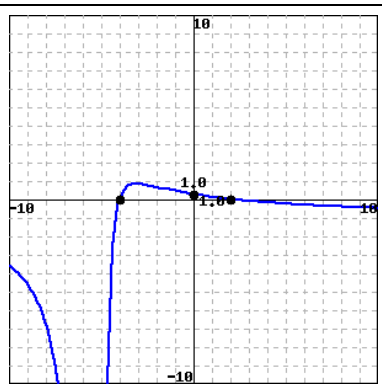
Note: If more than one, use commas to separate your answers

$y =$ ☐

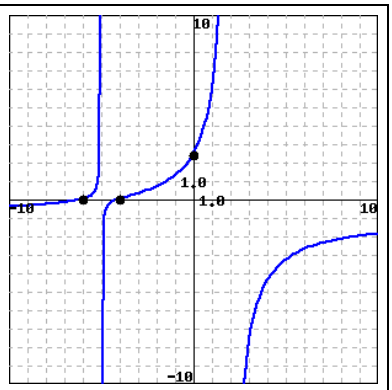
e. Select the correct graph of $y = f(x)$: ?



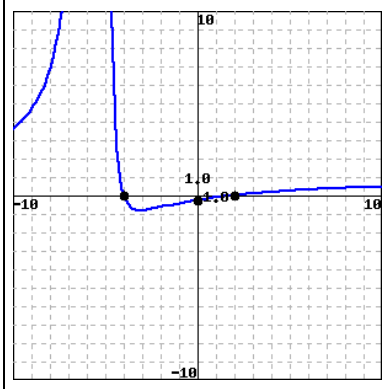
Graph A



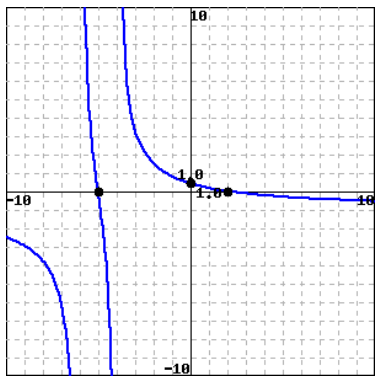
Graph B



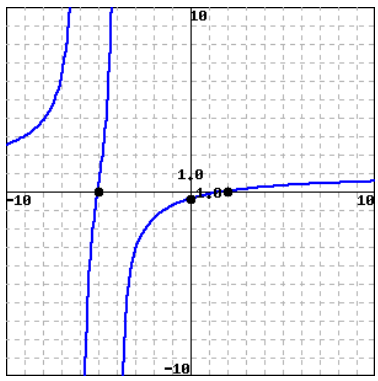
Graph C



Graph D



Graph E



Graph F

Note: *You can earn partial credit on this problem.*

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Problem 3. (10 points)

Find the inverse for the following function.

$$f(x) = \frac{-5x}{3x+4}$$

Answer: $f^{-1}(x) =$ ☐

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Problem 4. **(10 points)**

Let $f(x) = x^3 + 12x^2 + 37x + 10.$

(a) Find all roots of the polynomial $f(x)$ and simplify these roots as much as possible without approximation.

Roots: $x =$ ☐

- Do not approximate your solutions.
- Separate multiple solutions with commas.

(b) Sketch a complete graph, indicating the viewing window and the x-intercepts.

- Submit your hand-drawn graph directly to your instructor.

preview answers

Problem 5. **(10 points)**

- Use **degrees** for this problem, *not radians*.
- If you're using decimal approximations, you need to be accurate to *at least 3* decimal places.

a. ζ_1 is a complex number with modulus 4 and argument 36°.

Write ζ_1 in polar form: ☐

b. ζ_2 is a complex number with modulus 9 and argument 327°.

Write ζ_2 in polar form: ☐

c. Use what we know about ζ_1 and ζ_2 to answer the following questions about $\zeta_1 \cdot \zeta_2$:

What is the modulus of $\zeta_1 \cdot \zeta_2$? ☐

What is the argument of $\zeta_1 \cdot \zeta_2$? ☐

Write $\zeta_1 \cdot \zeta_2$ in polar form: ☐

Note: *You can earn partial credit on this problem.*

preview answers

Problem 6. **(10 points)**

Find the domain, asymptotes, and x-intercepts of the function, and then sketch its graph.

$$f(x) = \log(6 - x)$$

Domain: $D =$ ☐

- Use ‘inf’ for ∞, ‘-inf’ for $-\infty$, and ‘U’ for union.

Vertical asymptote: $x =$ ☐

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x-intercept: $x =$ ☐

- Submit your hand-drawn graph directly to your instructor.

Note: *You can earn partial credit on this problem.*

preview answers

Problem 7. **(10 points)**

State the amplitude, period and phase shift, and then sketch one complete cycle of the graph. Label all maxima, minima and x-intercepts.

$$y = 3 \cdot \sin(6x + \pi)$$

Amplitude= ☐

Period= ☐

Phase Shift= ☐

- Do not use decimal approximations. Use ‘pi’ to represent π.
- Use radians for this problem, not degrees.
- Submit your hand-drawn graph directly to your instructor.

Note: *You can earn partial credit on this problem.*

preview answers

Problem 8. **(10 points)**

Give expressions to represent all exact solutions to the equation in radians:

$$\tan^2(x) - \sqrt{3}\tan(x) = 0$$

Answer: $x =$ ☐

- Separate multiple solutions with commas.
- Use ‘n’ as the general integer parameter in your solution(s).
- Do not use decimal approximations. Use ‘pi’ to represent π.

preview answers

Problem 9. **(10 points)**

In 2011, the population of a colony is 17000, and is increasing exponentially at a rate of 5.5% per year.

(a) What will the population be in the year 2019?

Answer: Population size =

(b) In what year will the population have doubled?

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Answer: Year =

Note: *You can earn partial credit on this problem.*

preview answers

Problem 10. **(10 points)**

Find the sum of the first 97 terms of the arithmetic sequence:

$$9, 18, 27, 36, 45, \ldots$$

Answer:

preview answers

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