1. (2 points)
Suppose
$$f(x) = |x| \cdot x$$
Then

$f^{-1}(x) =$ ____ if $x \geq 0$,

and

$f^{-1}(x) =$ ____ if $x \leq 0$.

Hint: Compute the inverse function separately in the two cases. It may also help to draw the graph of f.

Answer(s) submitted:

- `sqrtx`
- `sqrt-x`

(score 0.5)

2. (2 points)
Let $f(x) = 9 + (3x+7)^3$.
Find $f^{-1}(x) =$ ____________________
Find $\left(f(x)\right)^{-1} =$ ____________________

Answer(s) submitted:

-
-

(incorrect)

3. (4 points)
Suppose
$$f(x) = x + 4 \quad \text{and} \quad g(x) = 2x - 5.$$
Then

$(f \circ g)(x) =$ ______.
$(f \circ g)^{-1}(x) =$ ______.
$(f^{-1} \circ g^{-1})(x) =$ ______.
$(g^{-1} \circ f^{-1})(x) =$ ______.

Answer(s) submitted:

-
-
-
-

(incorrect)

4. (5 points) Consider the function
$$f(x) = \frac{x}{8x-1}.$$
a) Find the inverse function for f
$f^{-1}(x)$= ______________,
(b) The domain of f is $x \mid x \neq$ ______

(c) The domain of f^{-1} is $x \mid x \neq$ ______

(d) The range of f is $y \mid y \neq$ ______

(d) The range of f^{-1} is $y \mid y \neq$ ______

Answer(s) submitted:

-
-
-
-
-

(incorrect)

5. (1 point) Let
$$f(x) = \frac{x+4}{x+7}$$

$f^{-1}(-3) =$ ________

Answer(s) submitted:

-

(incorrect)

6. (5 points) Enter T or F depending on whether the function is one-to-one or not. (You must enter T or F – True and False will not work.)

___1. $c(x) = \dfrac{x-3}{2+x}$
___2. $b(x) = 3x^3 - 3x$
___3. $a(x) = 3x^4 - 2x$
___4. $e(x) = 3\sqrt{x+2}$
___5. $d(x) = (3x-3)^2 + 3$

Answer(s) submitted:

-
-
-
-
-

(incorrect)

7. (1 point) Let $f(x) = x^3 + 4x + 4$. Find x if $f^{-1}(x) = 0$.
$x =$ ___
Answer(s) submitted:

-

(incorrect)

8. (1 point)

Find the inverse function of $g(x) = \frac{\sqrt{x}+4}{7-\sqrt{x}}$. If the function is not invertible, enter **NONE**.
$g^{-1}(x) =$ ___
(Write your inverse function in terms of the independent variable x.)
Answer(s) submitted:

-

(incorrect)

9. (4 points)

Consider the functions $f(x) = \sqrt[3]{\frac{x}{5}} + 9$, $g(x) = \sqrt[3]{\frac{x-9}{5}}$, $h(x) = 9 + 5x^3$, $p(x) = -9 + 5x^3$, $q(x) = \sqrt[3]{\frac{x}{5}} - 9$, and $r(x) = \sqrt[3]{\frac{x+9}{5}}$.
Which of these functions are inverses of each other?

- A. $g(x)$ and $h(x)$
- B. $h(x)$ and $q(x)$
- C. $f(x)$ and $p(x)$
- D. $p(x)$ and $q(x)$
- E. $f(x)$ and $h(x)$
- F. $g(x)$ and $p(x)$
- G. $h(x)$ and $r(x)$
- H. $p(x)$ and $r(x)$
- I. No pairs of these functions are inverses of each other.

Answer(s) submitted:

-

(incorrect)

10. (1 point)

Consider the functions $f(x) = e^{7x}$, $g(x) = \ln(x) - 7$, $h(x) = 7\ln(x)$, $p(x) = \ln\left(\frac{x}{7}\right)$, $q(x) = \ln(x) + 7$, $r(x) = \ln(7x)$, and $s(x) = \frac{\ln(x)}{7}$.
Which of the following functions is an inverse function of $f(x)$?

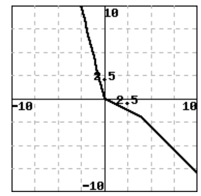
- A. $g(x)$
- B. $h(x)$
- C. $p(x)$
- D. $q(x)$
- E. $r(x)$
- F. $s(x)$
- G. None of these functions is an inverse function of $f(x)$.

Answer(s) submitted:

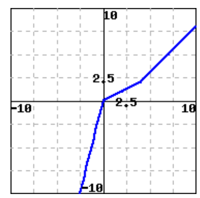
-

(incorrect)

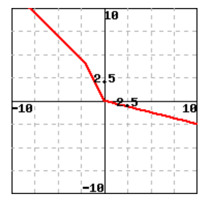
11. (1 point) Find the graph of the inverse of the function f graphed below.



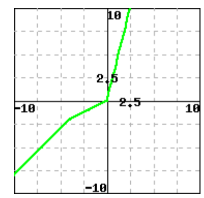
The graph of f



Graph **A**



Graph **B**



Graph **C**

The inverse of the function f is graphed in Graph (A, B or C): ___
Answer(s) submitted:

-

(incorrect)

12. (1 point)
If you are given the graph of f, how do you find the graph of f^{-1}?

(a) Reflect it over the x-axis.
(b) Reflect it over the y-axis.
(c) Reflect it over $y = x$.
(d) Reflect it over $y = -x$.

___
Answer(s) submitted:

-

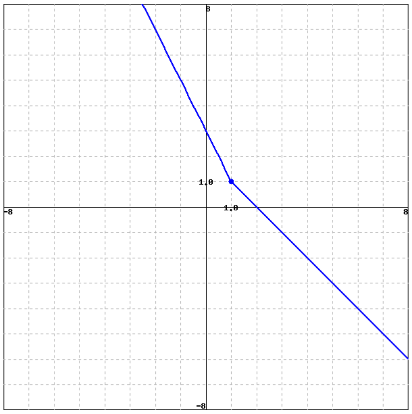
(incorrect)

13. (1 point) Find the inverse function of $f(x) = 3\log_2(6x - 4) + 9$.
$f^{-1}(x) =$ ___
Answer(s) submitted:

-

(incorrect)

14. (5 points) Use the given graph of the function f to find the following values for f^{-1}.



1. $f^{-1}(-4) =$ _____
2. $f^{-1}(-3) =$ _____
3. $f^{-1}(0) =$ _____
4. $f^{-1}(2) =$ _____
5. $f^{-1}(4) =$ _____

Note: *You can click on the graph to enlarge the image.*

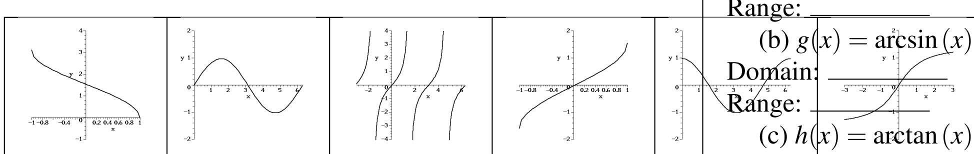
Answer(s) submitted:

-
-
-
-
-

(incorrect)

15. (6 points) Match the functions with their graphs.

___1. f(x) = cos(x)
___2. f(x) = sin(x)
___3. f(x) = tan(x)
___4. f(x) = arcsin(x)
___5. f(x) = arccos(x)
___6. f(x) = arctan(x)



A	B	C	D	E	F

(**Click on image for a larger view** . The small images may not show up properly on a hard copy, but they will be fine in a browser.)

Answer(s) submitted:

-
-
-
-
-
-

(incorrect)

16. (4 points) Evaluate the following expressions. Your answer must be an angle $-\pi/2 \le \theta \le \pi$ in radians, written as a multiple of π. Note that π is already provided in the answer so you simply have to fill in the appropriate multiple. E.g. if the answer is $\pi/2$ you should enter 1/2. Do not use decimal answers. Write the answer as a fraction or integer.
$\sin^{-1}(\sin((5\pi/3)) =$ _____ π
$\sin^{-1}(\sin(3\pi/4))=$ _____ π
$\cos^{-1}(\cos(-5\pi/6))=$ _____ π
$\cos^{-1}(\cos(3\pi/4))=$ _____ π

Answer(s) submitted:

-
-
-
-

(incorrect)

17. (3 points) Find the inverse of the following function and state its domain.
$f(x) = 6\cos(12x) + 4$
Type 'arccos' for the inverse cosine function in your answer.
$f^{-1}(x) =$ _________
Domain= [___ , ___]

Answer(s) submitted:

-
-
-

(incorrect)

18. (6 points)
State the domain and range of each of the following functions:
(Enter your answers as inequalities: help (inequalities). Your domains should be inequalities in x and ranges, in y. As always, type *pi* for π. If you wish to enter ∞, type *infinity* .)
(a) $f(x) = \arccos(x)$ has
Domain: _________
Range: _________
(b) $g(x) = \arcsin(x)$ has
Domain: _________
Range: _________
(c) $h(x) = \arctan(x)$ has
Domain: _________
Range: _________

Answer(s) submitted:

-
-
-
-
-
-

(incorrect)

---

19. (1 point) Find the exact value.
$\sin\left(2\cos^{-1}\left(\frac{9}{41}\right)\right) =$ ______
Answer(s) submitted:

-

(incorrect)

---

20. (4 points)
Find the domain and the range of $g(x) = \sin^{-1}(3x+1)$.
Domain: _____ $\leq x \leq$ _____
Range: _____ $\leq y \leq$ _____
Answer(s) submitted:

-
-
-
-

(incorrect)

---

21. (2 points)
Find the exact value of each expression:
(a) $\sec(\arctan(2))$
(b) $\cos(2\sin^{-1}(\frac{5}{13}))$
(a) _____
(b) _____
Answer(s) submitted:

-
-

(incorrect)

---

22. (2 points) Complete the identity using the triangle method

(a) $\cos(\tan^{-1}(x)) =$ __________

(b) $\sin(\sec^{-1}(x)) =$ __________
Answer(s) submitted:

-
-

(incorrect)

---

23. (1 point) Evaluate the limit
$\lim\limits_{x\to 16} \dfrac{16-x}{4-\sqrt{x}} =$ _____.
Answer(s) submitted:

-

(incorrect)

---

24. (6 points) Let

$$f(x) = \frac{5x-15}{x^4-12x^3+36x^2}.$$

Find each point of discontinuity of f, and for each give the value of the point of discontinuity and evaluate the indicated one-sided limits.

If needed, use 'INF' for ∞ and '-INF' for $-\infty$.
If you have more than one point, give them in numerical order, from smallest to largest.
If you have extra boxes, fill each in with an 'x'.

Point 1: $C =$ _____
$\lim\limits_{x\to C^-} f(x) =$ _____
$\lim\limits_{x\to C^+} f(x) =$ _____

Point 2: $C =$ _____
$\lim\limits_{x\to C^-} f(x) =$ _____
$\lim\limits_{x\to C^+} f(x) =$ _____

Point 3: $C =$ _____
$\lim\limits_{x\to C^-} f(x) =$ _____
$\lim\limits_{x\to C^+} f(x) =$ _____

Answer(s) submitted:

-
-
-
-
-
-
-
-
-

(incorrect)

---

25. (3 points)
Let $f(x) = \begin{cases} \sqrt{-3-x}+5, & \text{if } x < -4 \\ 5, & \text{if } x = -4 \\ 2x+14, & \text{if } x > -4 \end{cases}$

Calculate the following limits. Enter **DNE** if the limit does not exist.

$\lim\limits_{x\to -4^-} f(x) =$ _______

$\lim\limits_{x\to -4^+} f(x) =$ _______

$\lim\limits_{x\to -4} f(x) =$ _______
Answer(s) submitted:

- 6
- 6
- 6

(correct)

26. (1 point) Let $f(x) = \sqrt{x} - 7$.

Then $\lim\limits_{h\to 0} \dfrac{f(1+h)-f(1)}{h} =$ ______

If the limit does not exist enter DNE.

Answer(s) submitted:

- 1/2

(correct)

27. (4 points) Evaluate the limits.

$$f(x) = \begin{cases} \frac{|2x|}{x} & x \neq 0 \\ 0 & x = 0 \end{cases}$$

Enter **DNE** if the limit does not exist.

a) $\lim\limits_{x\to 0^-} f(x) =$ ____

b) $\lim\limits_{x\to 0^+} f(x) =$ ____

c) $\lim\limits_{x\to 0} f(x) =$ ____

d) $f(0) =$ ____

Answer(s) submitted:

- -2
- 2
- DNE
- 0

(correct)

28. (1 point) Use the Squeeze Theorem to evaluate the limit $\lim\limits_{x\to 2} f(x)$, if

$$4x - 4 \leq f(x) \leq x^2 \qquad \text{on } [0,4].$$

Enter **DNE** if the limit does not exist.

Limit = ____

Answer(s) submitted:

- 2

(incorrect)

29. (1 point) Use the Squeeze Theorem to evaluate the limit

$$\lim_{x\to 0} \sin x \cos\left(\frac{1}{x^5}\right)$$

Enter **DNE** if the limit does not exist.

Limit = ____

Answer(s) submitted:

-

(incorrect)

30. (3 points) Evaluate the limits. If a limit does not exist, enter **DNE**.

$\lim\limits_{x\to -6^+} \dfrac{|x+6|}{x+6} =$ ______

$\lim\limits_{x\to -6^-} \dfrac{|x+6|}{x+6} =$ ______

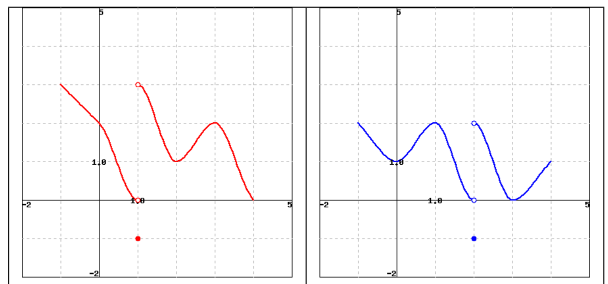
$\lim\limits_{x\to -6} \dfrac{|x+6|}{x+6} =$ ______

Answer(s) submitted:

-
-
-

(incorrect)

31. (24 points)



$f(x)$ | $g(x)$

The graphs of $f(x)$ and $g(x)$ are given above. Use them to evaluate each quantity below. Write *DNE* if the limit or value does not exist (or if it's infinity).

___1. $\lim\limits_{x\to 1^+} [f(x)g(x)]$

___2. $f(g(1))$

___3. $f(2)/g(2)$

___4. $\lim\limits_{x\to 2^+} [f(x)+g(x)]$

___5. $\lim\limits_{x\to 1^+} [f(g(x))]$

___6. $\lim\limits_{x\to 2^+} [f(g(x))]$

___7. $\lim\limits_{x\to 2^+} [f(x)/g(x)]$

___8. $\lim\limits_{x\to 1^-} [f(x)+g(x)]$

___9. $\lim\limits_{x\to 2^-} [f(g(x))]$

___10. $f(g(2))$

___11. $\lim\limits_{x\to 1^+} [f(x)+g(x)]$

___12. $\lim\limits_{x\to 2^-} [f(x)/g(x)]$

___13. $f(1)+g(1)$

___14. $\lim\limits_{x\to 2^-} [f(x)g(x)]$

___15. $f(1)/g(1)$

___16. $f(2)g(2)$

___17. $\lim\limits_{x\to 1^-} [f(x)g(x)]$

___18. $\lim\limits_{x\to 1^-} [f(x)/g(x)]$

___19. $\lim\limits_{x\to 2^-} [f(x)+g(x)]$

__20. $f(2)+g(2)$
__21. $\lim_{x\to 1^+}[f(x)/g(x)]$
__22. $f(1)g(1)$
__23. $\lim_{x\to 2^+}[f(x)g(x)]$
__24. $\lim_{x\to 1^-}[f(g(x))]$

Answer(s) submitted:

-
-
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-
-
-

(incorrect)

---

32. (3 points)

A function is said to have a **vertical asymptote** wherever the limit on the left or right (or both) is either positive or negative infinity.

For example, the function $f(x)=\dfrac{-3(x+2)}{x^2+4x+4}$ has a vertical asymptote at $x=-2$.

Find each of the following limits.

$\lim\limits_{x\to -2^-}\dfrac{-3(x+2)}{x^2+4x+4}=$________ help (limits)

$\lim\limits_{x\to -2^+}\dfrac{-3(x+2)}{x^2+4x+4}=$________ help (limits)

$\lim\limits_{x\to -2}\dfrac{-3(x+2)}{x^2+4x+4}=$ ________ help (limits)

Answer(s) submitted:

-
-
-

(incorrect)

---

33. (4 points)

Part 1: Evaluate the limit

Evaluate the following limit by simplifying the expression (first answer box) and then evaluating the limit (second answer box).

$$\lim_{x\to 9}\frac{x-9}{\sqrt{x}-\sqrt{9}}=\lim_{x\to 9}\text{\_\_\_\_\_\_\_\_}=\text{\_\_\_\_\_}.$$

Hint: Treat $x-9$ as a difference of squares. Note: In your written solution, you should write the limit statement $\lim\limits_{x\to 9}$ in every step except the last one, where the limit is finally evaluated.

Part 2: Follow-up question

Answer(s) submitted:

-
-
-
-

(incorrect)

---

34. (4 points) Evaluate the following limits:

1. $\lim\limits_{x\to 3^-}\dfrac{2}{x-3}$ = ________
2. $\lim\limits_{x\to 3^+}\dfrac{2}{x-3}$ = ________
3. $\lim\limits_{x\to 0}\dfrac{1}{x^2(x+7)}$ = ________
4. $\lim\limits_{x\to 5}\dfrac{2}{(x-5)^6}$ = ________

Answer(s) submitted:

-
-
-
-

(incorrect)

---

35. (5 points)

A function is said to have a **horizontal asymptote** if either the limit at infinity exists or the limit at negative infinity exists.
Show that each of the following functions has a horizontal asymptote by calculating the given limit.

$\lim\limits_{x\to\infty}\dfrac{-3x}{14+2x}=$ _____

$\lim\limits_{x\to-\infty}\dfrac{7x-4}{x^3+12x-4}=$ _____

$\lim\limits_{x\to\infty}\dfrac{x^2-4x-14}{10-7x^2}=$ _____

$\lim\limits_{x\to\infty}\dfrac{\sqrt{x^2+6x}}{10-10x}=$ _____

$\lim\limits_{x\to-\infty}\dfrac{\sqrt{x^2+6x}}{10-10x}=$ _____

Answer(s) submitted:

-

-
-
-
-

(incorrect)

---

36. (2 points) Let

$$f(x) = \frac{x+3}{4x^6}.$$

Find the equations of the horizontal asymptotes and the vertical asymptotes of $f(x)$. If there are no asymptotes of a given type, enter 'NONE'. If there is more than one asymptote of a given type, give a comma separated list (i.e.: 1, 2,...).
Horizontal asymptotes: $y =$ ______ Vertical Asymptotes: $x =$ ______

Answer(s) submitted:

-
-

(incorrect)

---

37. (1 point) Evaluate the limit

$$\lim_{y\to 3} \frac{4(y^2-1)}{4y^2(y-1)^3}$$

If the limit does not exist enter DNE.
Limit = ______

Answer(s) submitted:

-

(incorrect)

---

38. (1 point) Evaluate the limit

$$\lim_{y\to 1} \frac{y^3-1}{y^2-1}$$

If the limit does not exist enter DNE.
Limit = ______

Answer(s) submitted:

-

(incorrect)

---

39. (2 points) Identify the horizontal and vertical asymptotes, if any, of the given function.

$$f(x) = \frac{x^2-1}{-x^2-1}$$

Separate multiple answers by commas. Enter **DNE** if an asymptote does not exist.
a) Horizontal asymptote(s): $y =$ ______
b) Vertical asymptote(s): $x =$ ______

Answer(s) submitted:

-
-

(incorrect)

---

40. (2 points)

Evaluate the following limits. If needed, enter INF for ∞ and MINF for $-\infty$.
(a)

$$\lim_{x\to\infty} \left(\sqrt{x^2+4x+1} - x\right) =$$

______
(b)

$$\lim_{x\to-\infty} \left(\sqrt{x^2+4x+1} - x\right) =$$

______

Answer(s) submitted:

- `2`
- `INF`

(correct)

---

41. (1 point) Find the following limit.

Notes: Enter "DNE" if limit Does Not Exist.
$\lim_{x\to-\infty} \frac{-6e^{-x}+e^{x}}{5e^{-x}+3e^{x}} =$ ______

Answer(s) submitted:

- `-6/5`

(correct)

---

42. (1 point) Find the following limit.

Notes: Enter "DNE" if limit Does Not Exist.
$\lim_{x\to 0^+} \ln\left(\frac{4}{x^6}\right) =$ ______

Answer(s) submitted:

- `Infinity`

(correct)

---

43. (1 point) Find the following limit.

Notes: Enter "DNE" if limit Does Not Exist.
$\lim_{x\to \frac{\pi}{2}^-} e^{\tan(x)} =$ ______

Answer(s) submitted:

- `Infinity`

(correct)

---

44. (1 point) For the equation

$$x + \sin(x) = 1$$

does the intermediate value theorem show at least one solution on the interval $[0, \frac{\pi}{6}]$?
- ?
- Yes, it shows there must be at least one solution
- No, it is not conclusive
- No, it show no solutions

Answer(s) submitted:

- `Yes, it shows there must be at least one solution`

(correct)

45. (1 point) Find a value of the constant k, if possible, at which

$$f(x) = \begin{cases} kx^2 & x \leq -5 \\ 10x+k & x > -5 \end{cases}$$

is continuous everywhere.

$k =$ ________ (enter "none" if no value).

Answer(s) submitted:

- `-25/12`

(correct)

46. (4 points)

Part 1: Evaluate the limit

Part 2: Follow-up question

$\lim\limits_{x\to 1} \dfrac{\sqrt{x}-x^2}{1-\sqrt{x}} = \lim\limits_{x\to 1}$ ________ $=$ ______.

Answer(s) submitted:

- `x(1+x+x^2)`
- `3`
- `(1/(2*sqrtx)-2x)/-1/(2sqrtx)`
- `3`

(score 0.75)