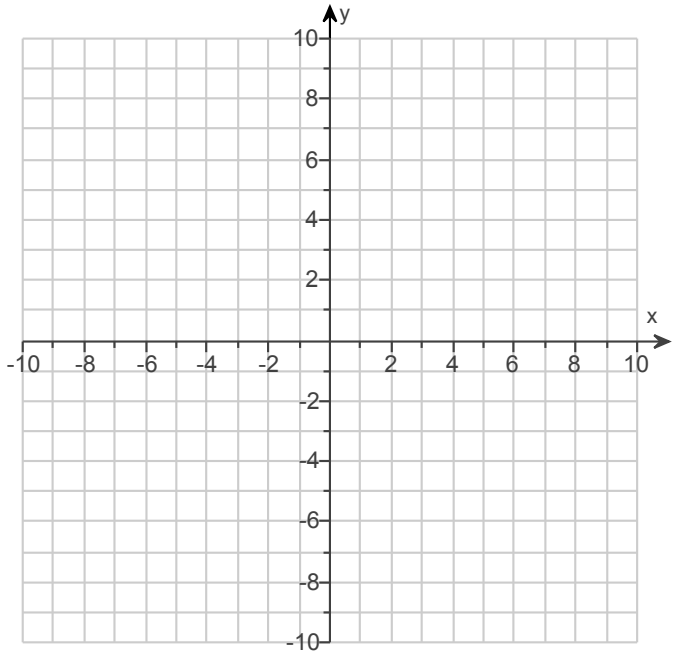
Student: _____	**Instructor:**	**Assignment:** Practice Problems for Test 3
Date: _____	**Course:** Math-1540-W-OL-F18	

1. Identify the coordinates of any local and absolute extreme points and inflection points. Graph the function $y = x^2 - 10x + 21$.



Identify the coordinates of any local maximum points. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The local maximum point(s) is/are _____.
  (Type an ordered pair. Use a comma to separate answers as needed.)
- **B.** There are no local maximum points.

Identify the coordinates of any local minimum points. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The local minimum point(s) is/are _____.
  (Type an ordered pair. Use a comma to separate answers as needed.)
- **B.** There are no local minimum points.

Identify the coordinates of the absolute maximum point. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The absolute maximum point is _____.
  (Type an ordered pair.)
- **B.** There is no absolute maximum point.

Identify the coordinates of the absolute minimum point. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The absolute minimum point is _____.
  (Type an ordered pair.)
- **B.** There is no absolute minimum point.

Identify the inflection point(s). Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The point(s) is/are _____.
  (Type an ordered pair. Use a comma to separate answers as needed.)

○ **B.** There are no inflection points.

Use the graphing tool to graph the function.

---

2. Find the smallest perimeter and the dimensions for a rectangle with an area of 4 in^2.

The smallest perimeter for a rectangle with an area of 4 in^2 is _____ in.
(Simplify your answer.)

The dimensions of this rectangle are _____ in.
(Simplify your answers. Use a comma to separate answers.)

---

3. First use l'Hôpital's Rule to evaluate $\lim_{x\to 5} \frac{8x-40}{2x^2-50}$. Then determine the limit using limit laws and commonly known limits.

$\lim_{x\to 5} \frac{8x-40}{2x^2-50}$ by l'Hôpital's Rule is _____.
(Type a simplified fraction.)

Choose the limit equivalent to the given limit that can be evaluated using limit laws and commonly known limits.

○ **A.** $\lim_{x\to 5} \frac{8}{4x}$

○ **B.** $\lim_{x\to 5} \frac{8}{2(x+5)}$

○ **C.** $\lim_{x\to 5} \frac{40}{2(x+5)}$

○ **D.** $\lim_{x\to 5} \frac{2(x+5)}{8}$

The limit by substitution is _____.
(Type a simplified fraction.)

---

4. A rectangular plot of farmland will be bounded on one side by a river and on the other three sides by a single-strand electric fence. With 2000 m of wire at your disposal, what is the largest area you can enclose, and what are its dimensions?

The maximum area of the rectangular plot is _____ (1) _____

The length of the shorter side of the rectangular plot is _____ (2) _____

The length of the longer side of the rectangular plot is _____ (3) _____

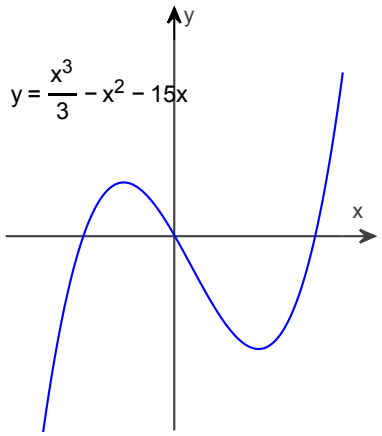
(1) ○ m^2. ○ m^3. ○ m.

(2) ○ m. ○ m^2. ○ m^3.

(3) ○ m. ○ m^2. ○ m^3.

---

5. Identify the inflection points and local maxima and minima of the function graphed to the right. Identify the intervals on which it is concave up and concave down.



Find the inflection point(s). Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The point(s) is/are _____. (Type an ordered pair. Simplify your answer. Use a comma to separate answers as needed.)
- **B.** There are no inflection points.

Find each local maximum. Select the correct choice below and, if necessary, fill in the answer box(es) to complete your choice.

- **A.** There is one local maximum value of _____ at x = _____. (Simplify your answers.)
- **B.** There are two local maxima. In increasing order of x-value, the values are _____ and _____ at x = _____ and x = _____, respectively. (Simplify your answers.)
- **C.** There are no local maxima.

Find each local minimum. Select the correct choice below and, if necessary, fill in the answer box(es) to complete your choice.

- **A.** There is one local minimum value of _____ at x = _____. (Simplify your answers.)
- **B.** There are two local minima. In increasing order of x-value, the values are _____ and _____ at x = _____ and x = _____, respectively. (Simplify your answers.)
- **C.** There are no local minima.

Identify the interval(s) on which the function is concave up. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The interval(s) is/are _____. (Simplify your answer. Use a comma to separate answers as needed. Type your answer in interval notation.)

answer in interval notation.)

- **B.** The function is never concave up.

Identify the interval(s) on which the function is concave down. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The interval(s) is/are _____.
  (Simplify your answer. Use a comma to separate answers as needed. Type your answer in interval notation.)
- **B.** The function is never concave down.

---

6. Identify the coordinates of any local and absolute extreme points and inflection points. Graph the function.

$y = x^4 - 2x^2 = x^2(x^2 - 2)$

Identify the coordinates of any local maximum points. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The local maximum point(s) is/are _____.
  (Type an ordered pair. Type an exact answer, using radicals as needed. Use a comma to separate answers as needed.)
- **B.** There are no local maximum points.

Identify the coordinates of any local minimum points. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The local minimum point(s) is/are _____.
  (Type an ordered pair. Type an exact answer, using radicals as needed. Use a comma to separate answers as needed.)
- **B.** There are no local minimum points.

Identify the coordinates of any absolute maximum points. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The absolute maximum point(s) is/are _____.
  (Type an ordered pair. Type an exact answer, using radicals as needed. Use a comma to separate answers as needed.)
- **B.** There is no absolute maximum point.

Identify the coordinates of the absolute minimum point. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The absolute minimum point(s) is/are _____.
  (Type an ordered pair. Type an exact answer, using radicals as needed. Use a comma to separate answers as needed.)
- **B.** There is no absolute minimum point.

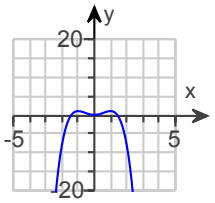
Identify the inflection point(s). Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

○ **A.** The point(s) is/are _____.
(Type an ordered pair. Type an exact answer, using radicals as needed. Use a comma to separate answers as needed.)

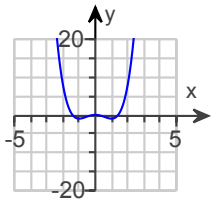
○ **B.** There are no inflection points.

Choose the correct graph of $y = x^4 - 2x^2$.

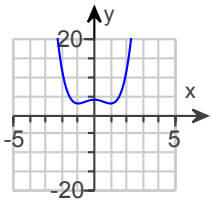
○ **A.**



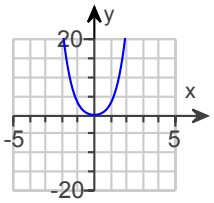
○ **B.**



○ **C.**



○ **D.**



---

7. Find the value or values of c that satisfy the equation $\frac{f(b) - f(a)}{b - a} = f'(c)$ in the conclusion of the mean value theorem for the given function and interval.

$f(x) = \sqrt{x - 4}$, $[4,7]$

c = _____
(Simplify your answer. Use a comma to separate answers as needed.)

---

8. Find the extreme values of the function and where they occur.

$y = x^2 + 2x - 3$

○ **A.** The minimum is -1 at $x = 4$.
○ **B.** The minimum is -4 at $x = -1$.
○ **C.** The minimum is 1 at $x = -4$.
○ **D.** The minimum is 1 at $x = 4$.

---

9. Find the most general antiderivative or indefinite integral. You may need to try a solution and then adjust your guess. Check your answer by differentiation.

$\int x^{-8}(x + 1)\, dx$

$\int x^{-8}(x + 1)\, dx =$ _____
(Use C as the arbitrary constant.)

---

10. Find the absolute maximum and minimum values of the following function on the given interval. Then graph the function. Identify the points on the graph where the absolute extrema occur.

$$f(\theta) = \sin\theta,\ \frac{\pi}{2} \le \theta \le \frac{7\pi}{4}$$

Find the absolute maximum. Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

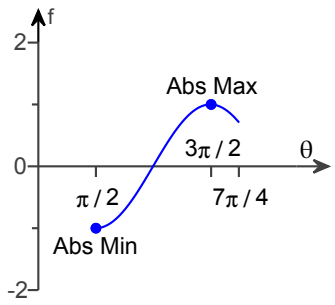
- **A.** The absolute maximum value _____ occurs at $\theta =$ _____.
  (Use a comma to separate answers as needed. Type exact answers, using π as needed.)
- **B.** There is no absolute maximum.

Find the absolute minimum. Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

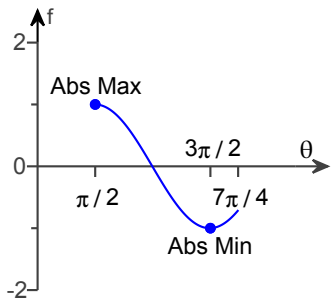
- **A.** The absolute minimum value _____ occurs at $\theta =$ _____.
  (Use a comma to separate answers as needed. Type exact answers, using π as needed.)
- **B.** There is no absolute minimum.

Choose the correct graph of the function.

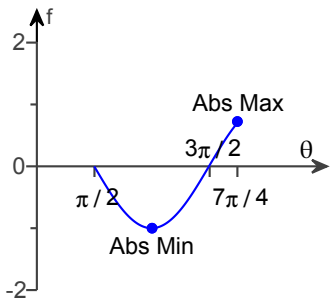
A.



B.



C.



2

11. Use l'Hôpital's Rule to find the limit.

$$\lim_{x\to 0} \frac{4x^2}{\cos(x) - 1}$$

$$\lim_{x\to 0} \frac{4x^2}{\cos(x) - 1} = \_\_\_\_\_$$ (Type an exact answer.)

12. Use l'Hôpital's Rule to evaluate $\lim_{t\to 0} \frac{-5\sin\left(9t^3\right)}{4t}$.

$$\lim_{t\to 0} \frac{-5\sin\left(9t^3\right)}{4t} = \_\_\_\_\_$$ (Type an exact answer.)

13. **a.** Find the open interval(s) on which the function is increasing and decreasing.
b. Identify the function's local and absolute extreme values, if any, saying where they occur.

$g(t) = -5t^2 + 3t - 2$

a. Find the open intervals on which the function is increasing. Select the correct choice below and fill in any answer boxes within your choice.

- **A.** The function is increasing on the open interval(s) _____.
  (Type your answer in interval notation. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- **B.** The function is never increasing.

Find the open intervals on which the function is decreasing. Select the correct choice below and fill in any answer boxes within your choice.

- **A.** The function is decreasing on the open interval(s) _____.
  (Use interval notation. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- **B.** The function is never decreasing.

b. Find each local maximum, if there are any.

(Type integers or simplified fractions.)

- **A.** The function has a local maximum value at three values of t. In increasing order of t-value, the maximum values are $g($_____$) =$ _____, $g($_____$) =$ _____, and $g($_____$) =$ _____.
- **B.** The function has a local maximum value at one value of t. The maximum value is $g($_____$) =$ _____.
- **C.** The function has a local maximum value at two values of t. In increasing order of t-value, the maximum values are $g($_____$) =$ _____ and $g($_____$) =$ _____.
- **D.** There are no local maxima.

Find each local minimum, if there are any.

(Type integers or simplified fractions.)

- **A.** The function has a local minimum value at two values of t. In increasing order of t-value, the minimum values are $g($_____$) =$ _____ and $g($_____$) =$ _____.
- **B.** The function has a local minimum value at one value of t. The minimum value is $g($_____$) =$ _____.
- **C.** The function has a local minimum value at three values of t. In increasing order of t-value, the minimum values are $g($_____$) =$ _____, $g($_____$) =$ _____, and $g($_____$) =$ _____.
- **D.** There are no local minima.

If the function has extreme values, which of the extreme values, if any, are absolute?

(Type integers or simplified fractions. Use a comma to separate answers as needed.)

- **A.** The function has no absolute maximum, but there is an absolute minimum value of _____ at $t =$ _____.

- **B.** The function has an absolute maximum value of _____ at t = _____, but no absolute minimum.
- **C.** The function has an absolute maximum value of _____ at t = _____ and an absolute minimum of _____ at t = _____.
- **D.** There are no absolute extreme values.
- **E.** There are no extreme values.

---

14. Find the value or values of c that satisfy the equation $\frac{f(b) - f(a)}{b - a} = f'(c)$ in the conclusion of the Mean Value Theorem for the function and interval.

$f(x) = x^2 + 2x + 2, \ [-3, -2]$

- **A.** $-\frac{5}{2}, \frac{5}{2}$
- **B.** $-\frac{5}{2}$
- **C.** $0, -\frac{5}{2}$
- **D.** $-3, -2$

15. Answer the following questions about the function whose derivative is $f'(x) = x(x-3)$.
a. What are the critical points of f?
b. On what open intervals is f increasing or decreasing?
c. At what points, if any, does f assume local maximum and minimum values?

a. Find the critical points, if any. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The critical point(s) of f is/are $x =$ _____.
  (Simplify your answer. Use a comma to separate answers as needed.)
- **B.** The function f has no critical points.

b. Determine where f is increasing and decreasing. Select the correct choice below and fill in the answer box to complete your choice.

(Type your answer in interval notation. Use a comma to separate answers as needed.)

- **A.** The function f is increasing on the open interval(s) _____, and never decreasing.
- **B.** The function f is increasing on the open interval(s) _____, and decreasing on the open interval(s) _____.
- **C.** The function f is decreasing on the open interval(s) _____, and never increasing.

c. Determine the local maximum/maxima, if any. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The function f has a local maximum at $x =$ _____.
  (Simplify your answer. Use a comma to separate answers as needed.)
- **B.** There is no local maximum.

Determine the local minimum/minima, if any. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** There is no local minimum.
- **B.** The function f has a local minimum at $x =$ _____.
  (Simplify your answer. Use a comma to separate answers as needed.)

16. Using the derivative of f(x) given below, determine the intervals on which f(x) is increasing or decreasing.

$f'(x) = (2-x)(8-x)$

- **A.** Decreasing on $(-\infty, 2) \cup (8, \infty)$; increasing on $(2, 8)$
- **B.** Decreasing on $(2, 8)$; increasing on $(-\infty, 2) \cup (8, \infty)$
- **C.** Decreasing on $(-\infty, 2)$; increasing on $(8, \infty)$
- **D.** Decreasing on $(-\infty, -2) \cup (-8, \infty)$; increasing on $(-2, -8)$

17. Find the most general antiderivative.

$$\int \left(\frac{1}{x^5} - x^5 - \frac{1}{9} \right) dx$$

- **A.** $\frac{1}{6x^6} - \frac{x^4}{4} + \frac{1}{81} + C$
- **B.** $\frac{1}{5x^6} - \frac{x^6}{6} - \frac{1}{9x} + C$
- **C.** $-5x^4 - 5x^5 + C$
- **D.** $-\frac{1}{4x^4} - \frac{x^6}{6} - \frac{x}{9} + C$

---

18. Find an antiderivative of the given function.

$$\cos \pi x + 9 \sin \frac{x}{9}$$

- **A.** $\frac{1}{\pi} \sin \pi x - \cos \frac{x}{9}$
- **B.** $-\sin \pi x - 81 \cos \frac{x}{9}$
- **C.** $-\pi \sin \pi x + \cos \frac{x}{9}$
- **D.** $\frac{1}{\pi} \sin \pi x - 81 \cos \frac{x}{9}$

---

19. Find the absolute maximum and minimum values of the following function on the given interval. Then graph the function.

$f(x) = \frac{4}{5}x + 3,\ 0 \le x \le 3$

Find the absolute maximum value. Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

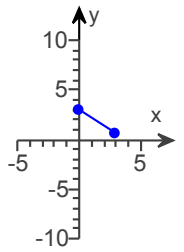
- **A.** The absolute maximum value _____ occurs at x = _____.
  (Simplify your answers. Use a comma to separate answers as needed.)
- **B.** There is no absolute maximum.

Find the absolute minimum value. Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

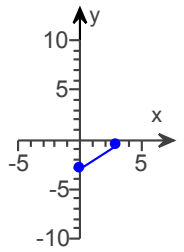
- **A.** The absolute minimum value _____ occurs at x = _____.
  (Simplify your answers. Use a comma to separate answers as needed.)
- **B.** There is no absolute minimum.

Graph the function. Choose the correct answer below.

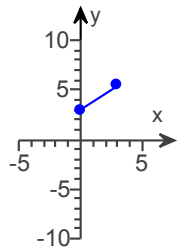
A.



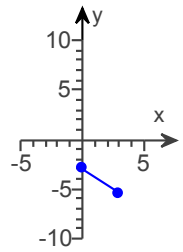
B.



C.



D.



20. Find the antiderivative for each function when C equals 0. Check your answers by differentiation.

(a) $h(x) = \frac{2}{9}x^{-\frac{1}{9}}$ **(b)** $g(x) = \frac{1}{9}x^{-\frac{2}{9}}$ **(c)** $k(x) = -\frac{1}{9}x^{-\frac{10}{9}}$

(a) H(x) = _____

(b) G(x) = _____

(c) K(x) = _____

Answers

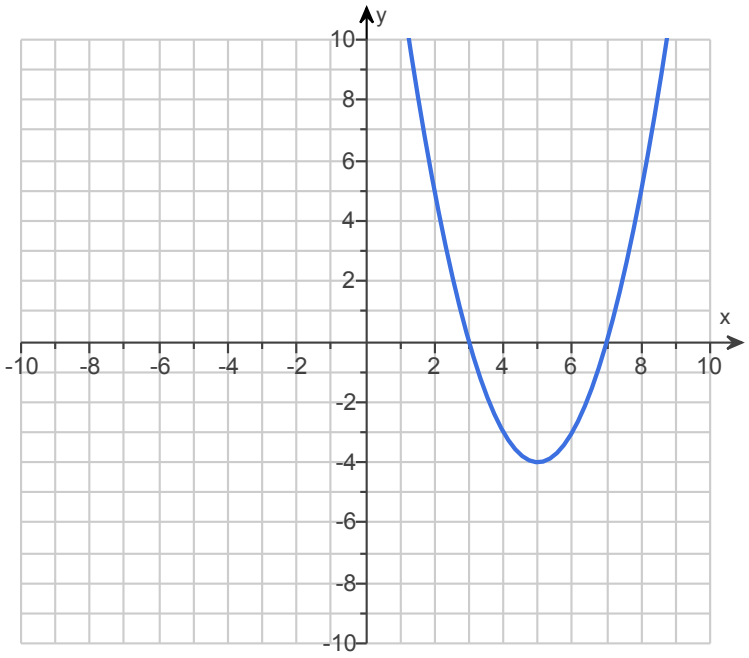
1. B. There are no local maximum points.

   A. The local minimum point(s) is/are **(5, − 4)** .
   (Type an ordered pair. Use a comma to separate answers as needed.)

   B. There is no absolute maximum point.

   A. The absolute minimum point is **(5, − 4)** .(Type an ordered pair.)

   B. There are no inflection points.



---

2. 8

   2,2

---

3. $\frac{2}{5}$

   B. $\lim_{x \to 5} \frac{8}{2(x+5)}$

   $\frac{2}{5}$

---

4. 500,000

(1) m^2.

500

(2) m.

1000

(3) m.

---

5. A. The point(s) is/are $\left(1, -\frac{47}{3}\right)$.

(Type an ordered pair. Simplify your answer. Use a comma to separate answers as needed.)

A. There is one local maximum value of **27** at x = **−3** .(Simplify your answers.)

A. There is one local minimum value of $-\frac{175}{3}$ at x = **5** .(Simplify your answers.)

A. The interval(s) is/are **(1,∞)** .
(Simplify your answer. Use a comma to separate answers as needed. Type your answer in interval notation.)

A. The interval(s) is/are **(−∞,1)** .
(Simplify your answer. Use a comma to separate answers as needed. Type your answer in interval notation.)

---

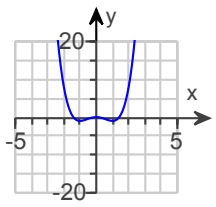
6. A. The local maximum point(s) is/are **(0,0)** .
(Type an ordered pair. Type an exact answer, using radicals as needed. Use a comma to separate answers as needed.)

A. The local minimum point(s) is/are **(−1,−1),(1,−1)** .
(Type an ordered pair. Type an exact answer, using radicals as needed. Use a comma to separate answers as needed.)

B. There is no absolute maximum point.

A. The absolute minimum point(s) is/are **(−1,−1),(1,−1)** .
(Type an ordered pair. Type an exact answer, using radicals as needed. Use a comma to separate answers as needed.)

A. The point(s) is/are $\left(-\frac{\sqrt{3}}{3}, -\frac{5}{9}\right), \left(\frac{\sqrt{3}}{3}, -\frac{5}{9}\right)$.
(Type an ordered pair. Type an exact answer, using radicals as needed. Use a comma to separate answers as needed.)



B.

---

7. $\frac{19}{4}$

---

8. B. The minimum is -4 at $x = -1$.

---

9. $-\frac{1}{6}x^{-6} - \frac{1}{7}x^{-7} + C$

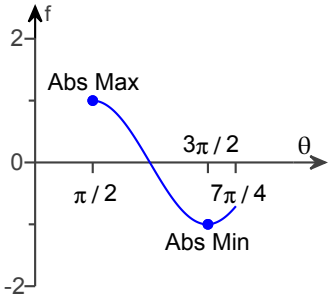
---

10. A. The absolute maximum value **1** occurs at $\theta =$ $\frac{\pi}{2}$.

(Use a comma to separate answers as needed. Type exact answers, using π as needed.)

A. The absolute minimum value **−1** occurs at $\theta =$ $\frac{3\pi}{2}$.

(Use a comma to separate answers as needed. Type exact answers, using π as needed.)



B.

---

11. -8

---

12. 0

---

13. A. The function is increasing on the open interval(s) $\left(-\infty, \frac{3}{10}\right)$.

(Type your answer in interval notation. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

A. The function is decreasing on the open interval(s) $\left(\frac{3}{10}, \infty\right)$.

(Use interval notation. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

B.
The function has a local maximum value at one value of t. The maximum value is
$g\left(\frac{3}{10}\right) = -\frac{31}{20}$.

D. There are no local minima.

B.

The function has an absolute maximum value of $-\frac{31}{20}$ at t = $\frac{3}{10}$, but no absolute minimum.

---

14. B. $-\frac{5}{2}$

---

15. A. The critical point(s) of f is/are x = **0,3** .
(Simplify your answer. Use a comma to separate answers as needed.)

B.
The function f is increasing on the open interval(s) **$(-\infty,0),(3,\infty)$** , and decreasing on the open interval(s) **(0,3)** .

A. The function f has a local maximum at x = **0** .
(Simplify your answer. Use a comma to separate answers as needed.)

B. The function f has a local minimum at x = **3** .
(Simplify your answer. Use a comma to separate answers as needed.)

---

16. B. Decreasing on (2, 8); increasing on $(-\infty, 2) \cup (8, \infty)$

---

17. D. $-\frac{1}{4x^4} - \frac{x^6}{6} - \frac{x}{9} + C$

---

18. D. $\frac{1}{\pi}\sin \pi x - 81 \cos \frac{x}{9}$

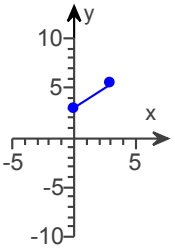
---

19. A. The absolute maximum value $\frac{27}{5}$ occurs at x = 3.

(Simplify your answers. Use a comma to separate answers as needed.)

A. The absolute minimum value 3 occurs at x = 0.

(Simplify your answers. Use a comma to separate answers as needed.)



C.

---

20. $\frac{1}{4}x^{\frac{8}{9}}$

$\frac{1}{7}x^{\frac{7}{9}}$

$x^{-\frac{1}{9}}$
