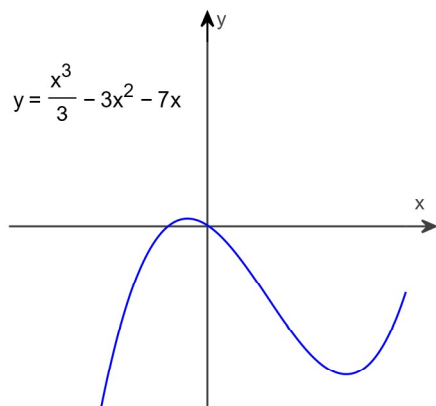


Student: Cole Lamers
Date: 09/26/19

Instructor: Viktoriya Shcherban
Course: Calc 1 11:30 AM / Internet
 (81749&81750) Shcherban

Assignment: 4.4 Concavity and Curve Sketching

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



The curve $y = \frac{x^3}{3} - 3x^2 - 7x$ has a point of inflection at $(3, -39)$.

(Type an ordered pair. Type a simplified fraction.)

Choose the correct answer regarding local maxima and minima.

- ☒ **A.** Local maximum: $\frac{11}{3}$ at $x = -1$
 Local minimum: $-\frac{245}{3}$ at $x = 7$
- ☐ **B.** Local minima: -39 at $x = 3$
- ☐ **C.** Local maximum: $-\frac{245}{3}$ at $x = 7$
 Local minimum: $\frac{11}{3}$ at $x = -1$
- ☐ **D.** No local maxima or minima

Choose the correct answer regarding concavity.

- ☐ **A.** Concave down on $(-\infty, \infty)$
- ☐ **B.** Concave up on $(-\infty, \infty)$
- ☐ **C.** Concave up on $(-\infty, 3)$
 Concave down on $(3, \infty)$
- ☒ **D.** Concave down on $(-\infty, 3)$
 Concave up on $(3, \infty)$

2.

Find the coordinates of any local extreme points and inflection points. Use these to graph the function $y = x^2 - 8x + 7$.

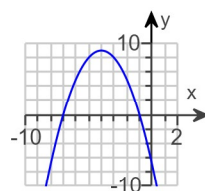
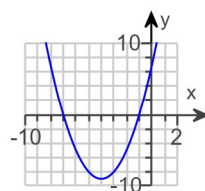
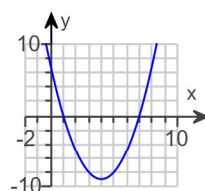
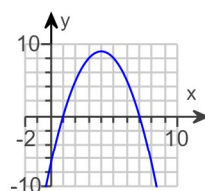
Choose the correct answer regarding local extreme points.

- ☒ A. The function has a local minimum at $(4, -9)$.
- ☐ B. The function has no local extreme points.
- ☐ C. The function has a local maximum at $(4, -9)$.

Choose the correct answer regarding inflection points.

- ☐ A. The function has an inflection point at $(4, -9)$.
- ☐ B. The function has inflection points at $(1, 0)$ and $(7, 0)$.
- ☒ C. The function has no inflection points.
- ☐ D. The function has an inflection point at $(0, 7)$.

Choose the correct graph of $y = x^2 - 8x + 7$.

☐ A.☐ B.☒ C.☐ D.

3.

Find the coordinates of any local extreme points and inflection points. Use these to graph the function $y = x^3 - 3x + 7$.

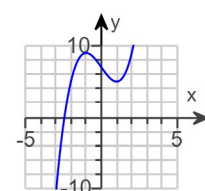
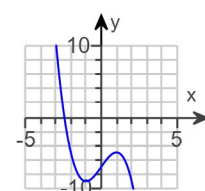
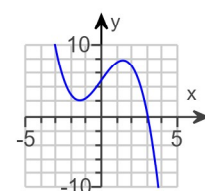
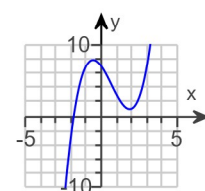
Choose the correct local extrema.

- ☐ A. There are no local extreme points.
- ☐ B. There is a local minimum at $(-1, 9)$ and a local minimum at $(1, 5)$.
- ☒ C. There is a local maximum at $(-1, 9)$ and a local minimum at $(1, 5)$.
- ☐ D. There is a local minimum at $(0, 7)$.

Choose the correct inflection points.

- ☐ A. There are inflection points at $(-1, 9)$ and $(1, 5)$.
- ☐ B. There are no inflection points.
- ☒ C. There is an inflection point at $(0, 7)$.

Choose the correct graph of $y = x^3 - 3x + 7$.

☒ A.☐ B.☐ C.☐ D.

4. Sketch the graph of the given function by determining the appropriate information and points from the first and second derivatives. Use a graphing calculator to check the graph.

$$y = x^3 - 5x^2 - 8x + 5$$

What are the coordinates of the relative maxima? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $\left(-\frac{2}{3}, \frac{211}{27}\right)$

(Simplify your answer. Type an ordered pair. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

☐ B. There is no maximum.

What are the coordinates of the relative minima? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $(4, -43)$

(Simplify your answer. Type an ordered pair. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

☐ B. There is no minimum.

What are the coordinates of the points of inflection? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $\left(\frac{5}{3}, -\frac{475}{27}\right)$

(Simplify your answer. Type an ordered pair. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

☐ B. There are no inflection points.

On what interval(s) is y increasing or decreasing?

☒ A. y is increasing on $x < -\frac{2}{3}$ and $x > 4$. y is decreasing on $-\frac{2}{3} < x < 4$.

☐ B. y is increasing on $x < \frac{5}{3}$. y is decreasing on $x > \frac{5}{3}$.

☐ C. y is increasing on $x > \frac{5}{3}$. y is decreasing on $x < \frac{5}{3}$.

☐ D. y is increasing on $-\frac{2}{3} < x < 4$. y is decreasing on $x < -\frac{2}{3}$ and $x > 4$.

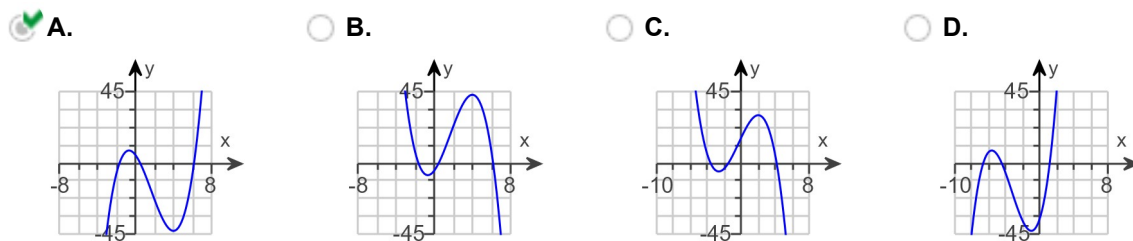
On what interval(s) is y concave up or concave down?

☐ A. y is concave up on $-\frac{2}{3} < x < 4$. y is concave down on $x < -\frac{2}{3}$ and $x > 4$.

☒ B. y is concave up on $x > \frac{5}{3}$. y is concave down on $x < \frac{5}{3}$.

☐ C. y is concave up on $x < -\frac{2}{3}$ and $x > 4$. y is concave down on $-\frac{2}{3} < x < 4$.

Choose the correct graph below.



5. Find and graph the coordinates of any local extreme points and inflection points of the function $y = x^4 - 4x^2$.

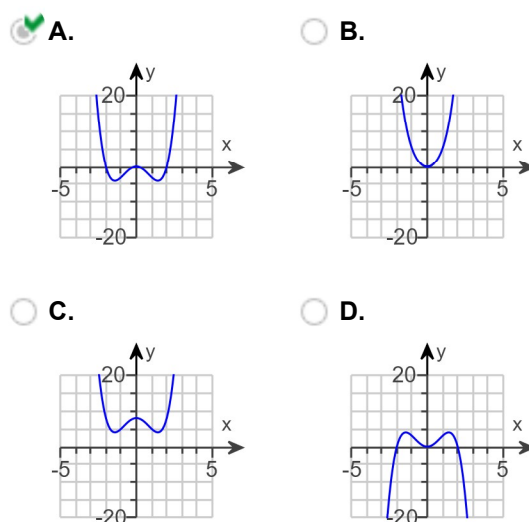
Choose the correct answer regarding local extreme points.

- ☐ **A.** No local extreme points
- ☒ **B.** Local minimum: $(-\sqrt{2}, -4)$, $(\sqrt{2}, -4)$
Local maximum: $(0, 0)$
- ☐ **C.** Local maximum: $(-\sqrt{2}, -4)$, $(\sqrt{2}, -4)$
Local minimum: $(0, 0)$

Choose the correct answer regarding inflection points.

- ☐ **A.** Inflection points: $(-\sqrt{2}, -4)$, $(\sqrt{2}, -4)$
- ☐ **B.** No inflection points
- ☒ **C.** Inflection points:
 $\left(-\frac{\sqrt{6}}{3}, -\frac{20}{9}\right)$, $\left(\frac{\sqrt{6}}{3}, -\frac{20}{9}\right)$

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



6.

Find the coordinates of any local extreme points and inflection points. Use these to graph the function $y = x + \sin(-x)$ on the interval $0 \leq x \leq 2\pi$.

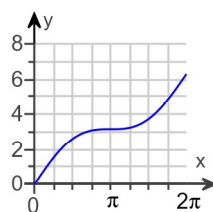
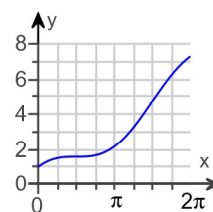
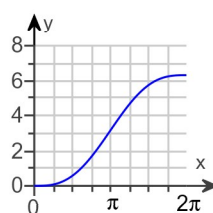
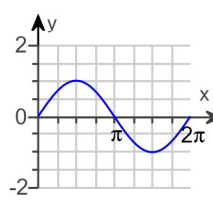
Choose the correct answer regarding local extreme points.

- ☐ A. Local maximum: $(0,0)$
Local minimum: $(2\pi, 2\pi)$
- ☐ B. The function has no local extreme points.
- ☐ C. The function has a local maximum at (π, π) .
- ☒ D. Local minimum: $(0,0)$
Local maximum: $(2\pi, 2\pi)$

Choose the correct answer regarding inflection points.

- ☐ A. The function has no inflection points.
- ☐ B. The function has an inflection point at $(0,0)$ and $(2\pi, 2\pi)$.
- ☒ C. The function has an inflection point at (π, π) .

Choose the correct graph of $y = x + \sin(-x)$.

☐ A.☐ B.☒ C.☐ D.

7.

Find and graph the coordinates of any local extreme points and inflection points of the function $y = \frac{x^2 - 7}{x - 4}$, $x \neq 4$.

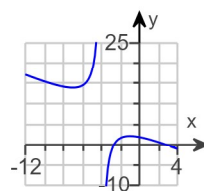
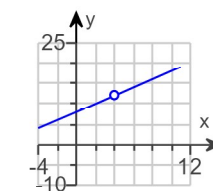
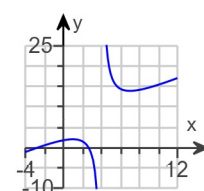
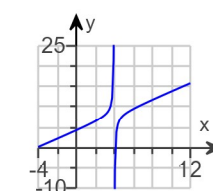
Choose the correct answer regarding local extreme points.

- ☐ A. The function has a local minimum at $(1,2)$ and a local maximum at $(7,14)$.
- ☐ B. The function has no local extreme points.
- ☒ C. The function has a local maximum at $(1,2)$ and a local minimum at $(7,14)$.

Choose the correct answer regarding inflection points.

- ☒ A. The function has no inflection points.
- ☐ B. The function has an inflection point at $(4,0)$.
- ☐ C. The function has inflection points at $(1,2)$ and $(7,14)$.

Choose the correct graph of $y = \frac{x^2 - 7}{x - 4}$.

☐ A.☐ B.☒ C.☐ D.

8. Graph the equation shown below. Find any local and absolute extreme points and inflection points.

$$y = \frac{8x}{x^2 + 4}$$

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

☒ **A.** $x =$.

(Type an exact answer, using radicals as needed. Use a comma to separate answers as needed.)

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

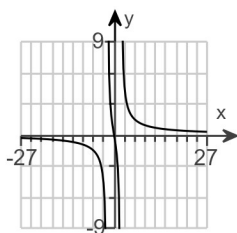
☒ **A.** The inflection point(s) is(are) at $x =$.

(Type an exact answer, using radicals as needed. Use a comma to separate answers as needed.)

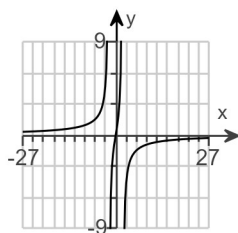
☐ **B.** There are no inflection points.

Choose the correct graph below.

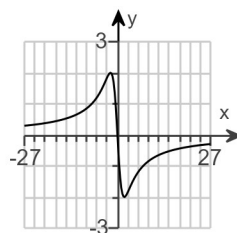
☐ **A.**



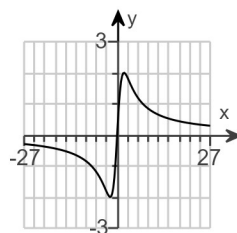
☐ **B.**



☐ **C.**



☒ **D.**

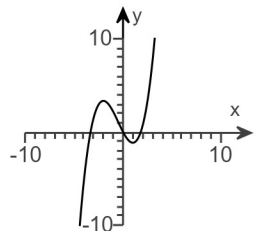
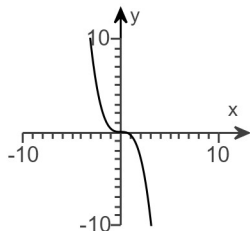
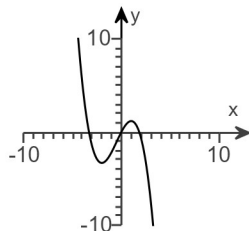
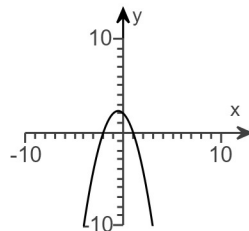


9. The first derivative of a continuous function $y = f(x)$ is given. Find y'' and then sketch the general shape of the graph of f .

$$y' = 2 - x - x^2$$

The second derivative is $y'' =$.

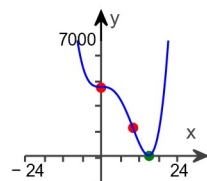
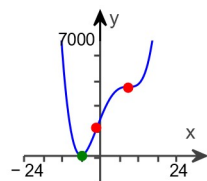
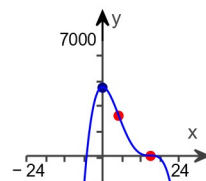
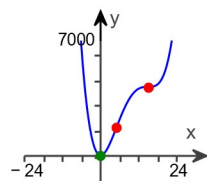
Choose the correct sketch of the general shape of the graph of f .

☐ A.

☐ B.

☒ C.

☐ D.


10. The first derivative of a continuous function $y = f(x)$ is $y' = x(x - 15)^2$. Find y'' and then use the graphing procedure to sketch the general shape of the graph of f .

$$y'' = 3x^2 - 60x + 225$$

Choose the correct graph below.

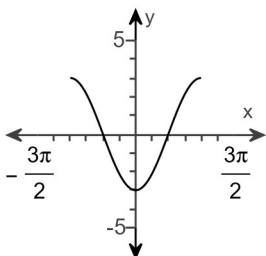
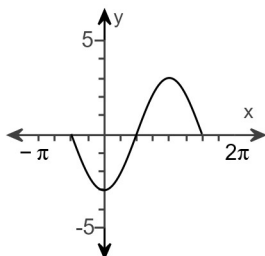
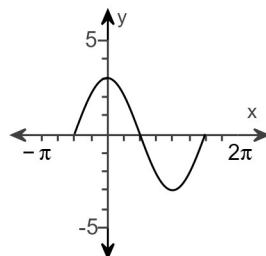
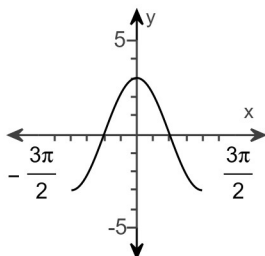
☐ A.

☐ B.

☐ C.

☒ D.


11. The first derivative of a continuous function $y = f(x)$ is given. Find y'' and then sketch the general shape of the graph of f .

$$y' = 3\sin x, \quad -\frac{\pi}{2} \leq x \leq \frac{3\pi}{2}$$

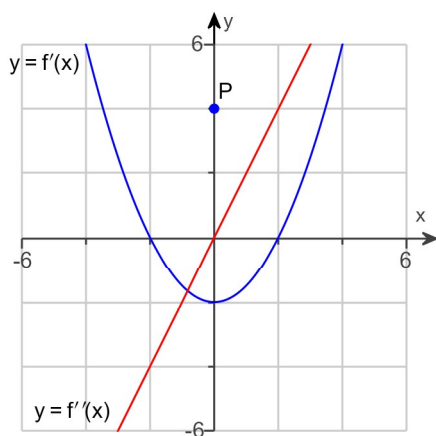
The second derivative is $y'' =$.

Choose the correct sketch of the general shape of the graph of f .

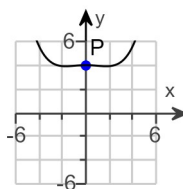
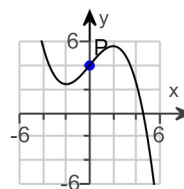
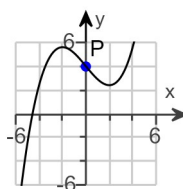
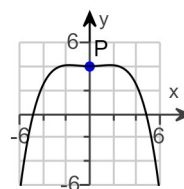
☐ A.

☒ B.

☐ C.

☐ D.


12.

The given figure shows the graphs of the first and second derivatives of a function $y = f(x)$. Sketch the approximate graph of f , given that the graph passes through the point P .



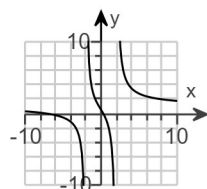
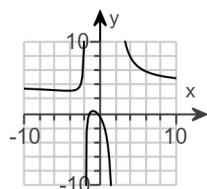
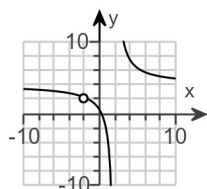
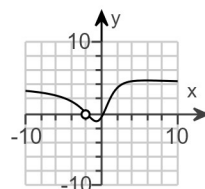
Which of the following is the correct graph of the function $y = f(x)$?

☐ A.☐ B.☒ C.☐ D.

13. Graph the following rational function.

$$y = \frac{4x^2 + 7x - 2}{x^2 - 4}$$

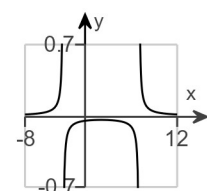
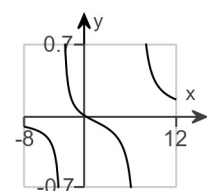
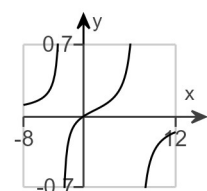
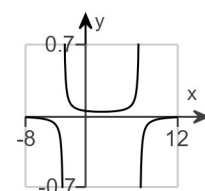
Choose the correct graph below.

☐ A.☐ B.☒ C.☐ D.

14. Graph the function, considering the domain, critical points, symmetry, regions where the function is increasing or decreasing, inflection points, regions where the function is concave upward or concave downward, intercepts where possible, and asymptotes where applicable.

$$f(x) = \frac{1}{x^2 - 4x - 21}$$

Choose the correct answer below.

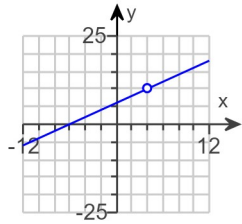
☒ A.☐ B.☐ C.☐ D.

15. Use the graphing guidelines to make a complete graph of f .

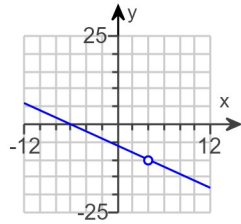
$$f(x) = \frac{x^2}{x-4}$$

What is the correct graph of $f(x) = \frac{x^2}{x-4}$?

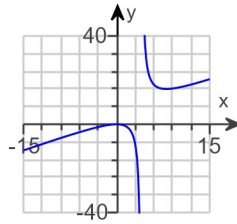
☐ A.



☐ B.



☒ C.



☐ D.

