1. Find the indicated derivative for each function.

   \[ h''(x) \text{ for } h(x) = 2x^{-7} - 9x^{-8} \]

   \[ h''(x) = \square \]

2. Find the x and y coordinates of all inflection points.

   \[ f(x) = x^3 + 15x^2 \]

   What is/are the inflection point(s)? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

   ○ A. The inflection point(s) is/are \square.
   (Type an ordered pair. Use a comma to separate answers as needed.)

   ○ B. There are no inflection points.
3. Find the intervals on which the graph of \( f \) is concave upward, the intervals on which the graph of \( f \) is concave downward, and the inflection points.

\[ f(x) = 20e^x - e^{2x} \]

For what interval(s) of \( x \) is the graph of \( f \) concave upward? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. [ ] 
  (Type your answer in interval notation. Type an exact answer. Use a comma to separate answers as needed.)

- B. The graph is never concave upward.

For what interval(s) of \( x \) is the graph of \( f \) concave downward? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. [ ] 
  (Type your answer in interval notation. Type an exact answer. Use a comma to separate answers as needed.)

- B. The graph is never concave downward.

What are the inflection point(s) of \( f \)? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. \( x = \) [ ] (Type an exact answer. Use a comma to separate answers as needed.)

- B. There are no inflection points.
4. Summarize the pertinent information obtained by applying the graphing strategy and sketch the graph of \( y = f(x) \).

\[ f(x) = (x - 6)(x^2 - 12x - 72) \]

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

- **A.** The domain of \( f \) is \( \underline{\hspace{2cm}} \).
  (Type your answer in interval notation. Type an exact answer, using radicals as needed. Use a comma to separate answers as needed.)

- **B.** The domain of \( f \) is empty.

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

- **A.** The \( x \)-intercept(s) of \( f \) is \( x = \underline{\hspace{2cm}} \).
  (Type an exact answer, using radicals as needed. Use a comma to separate answers as needed.)

- **B.** The function \( f \) has no \( x \)-intercepts.

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

- **A.** The \( y \)-intercept of \( f \) is \( y = \underline{\hspace{2cm}} \).
  (Type an exact answer, using radicals as needed. Use a comma to separate answers as needed.)

- **B.** The function \( f \) has no \( y \)-intercept.

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

- **A.** The function \( f \) is increasing on the subinterval(s) \( \underline{\hspace{2cm}} \).
  (Type your answer in interval notation. Use a comma to separate answers as needed.)

- **B.** The function \( f \) is never increasing.
4. (cont.)

☐ A. The function $f$ is decreasing on the subinterval(s) $\square$.
   (Type your answer in interval notation. Use a comma to separate answers as needed.)

☐ B. The function $f$ is never decreasing.

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 $x = \square$.
   (Use a comma to separate answers as needed.)

☐ B. The function $f$ has no local maximum.

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

☐ A. The function $f$ has a local minimum at $x = \square$.
   (Use a comma to separate answers as needed.)

☐ B. The function $f$ has no local minimum.

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

☐ A. The function $f$ is concave upward on the subinterval(s) $\square$.
   (Type your answer in interval notation. Use a comma to separate answers as needed.)

☐ B. The function $f$ is never concave upward.

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

☐ A. The function $f$ is concave downward on the subinterval(s) $\square$.
   (Type your answer in interval notation. Use a comma to separate answers as needed.)

☐ B. The function $f$ is never concave downward.

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

☐ A. The function $f$ has an inflection point at $x = \square$.
   (Use a comma to separate answers as needed.)

☐ B. The function $f$ has no inflection point.

Choose the correct graph of $y = f(x)$ below.
4. (cont.)

5. Use the given information to sketch the graph of $f$.
   - Domain: All real $x$, except $x = -2$.
   - $f(-6) = 0$; $f(-4) = 2$; $f(0) = -6$; $f(2) = -4$.
   - $f'(x) > 0$ on $(-\infty, -2)$ and $(-2, \infty)$.
   - $f''(x) > 0$ on $(-\infty, -2)$; $f''(x) < 0$ on $(-2, \infty)$.
   - Vertical asymptote: $x = -2$; Horizontal asymptote: $y = -2$.

Choose the correct graph below.

- Option A.
- Option B.
- Option C.
6. Find the domain and intercepts.

\[ f(x) = \sqrt{x + 9} \]

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

○ A. The domain of the function \( f(x) \) is \( \square \).
    (Type your answer in interval notation.)

○ B. The domain is all real numbers.

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

○ A. The x-intercept(s) of the graph is (are) \( x = \square \).
    (Simplify your answer. Type an integer or a decimal. Use a comma to separate answers as needed.)

○ B. There is no x-intercept.

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

○ A. The y-intercept(s) of the graph is (are) \( y = \square \).
    (Simplify your answer. Type an integer or a decimal. Use a comma to separate answers as needed.)

○ B. There is no y-intercept.
7. Summarize the pertinent information obtained by applying the graphing strategy and sketch the graph of \( f(x) = 6 + 6e^{-0.3x} \).

Summarize the pertinent information obtained by analyzing \( f(x) \).

**Domain:**
- (A) All real \( x \).
- (B) All real \( x \), except \( x = 0 \).
- (C) All real \( x \), except \( x = 6 \).
- (D) All real \( x \), except \( x = 3 \).

**Intercepts:**
- (A) \( x \)-intercept: none; \( y \)-intercept: \( y = 12 \).
- (B) \( x \)-intercept: \( x = 12 \); \( y \)-intercept: none.
- (C) \( x \)-intercept: \( x = 1 \); \( y \)-intercept: \( y = 6 \).
- (D) \( x \)-intercept: \( x = -1 \); \( y \)-intercept: none.

**Asymptotes:**
- (A) Horizontal asymptote: \( y = 0 \); Vertical asymptote: \( x = 0 \).
- (B) Horizontal asymptote: none; Vertical asymptote: \( x = 6 \).
- (C) Horizontal asymptote: \( y = 6 \); Vertical asymptote: \( x = 0 \).
- (D) Horizontal asymptote: \( y = 6 \); Vertical asymptote: none.

Summarize the pertinent information obtained by analyzing \( f'(x) \).

- (A) \( f(x) \) is decreasing on \( (-\infty, \infty) \).
- (B) \( f(x) \) is increasing on \( (-\infty, \infty) \).
- (C) \( f(x) \) is increasing on \( (-\infty, 0) \) and \( (0, \infty) \).
- (D) \( f(x) \) is decreasing on \( (-\infty, 0) \) and \( (0, \infty) \).
7. (cont.)

- **A.** There are no local extrema.
- **B.** There is a local maximum at \( x = 0 \).
- **C.** There is a local maximum at \( x = 6 \).
- **D.** There is a local minimum at \( x = 0 \).
- **E.** There is a local minimum at \( x = 6 \).

Summarize the pertinent information obtained by analyzing \( f''(x) \).

- **A.** \( f(x) \) is concave upward on \( (-\infty, 0) \) and concave downward on \( (0, \infty) \).
- **B.** \( f(x) \) is concave downward on \( (-\infty, \infty) \).
- **C.** \( f(x) \) is concave downward on \( (-\infty, 0) \) and concave upward on \( (0, \infty) \).
- **D.** \( f(x) \) is concave upward on \( (-\infty, \infty) \).

- **A.** There is an inflection point at \( x = 6 \).
- **B.** There is an inflection point at \( x = 12 \).
- **C.** There is an inflection point at \( x = 0 \).
- **D.** There are no inflection points.

Now sketch the graph. Choose the correct answer below.

- **A.**
- **B.**
- **C.**
- **D.**
8. Show that the line \( y = x \) is an oblique asymptote for the graph of \( f(x) = x + \frac{9}{x} \), summarize the pertinent information obtained by applying the graphing strategy, and sketch the graph of \( y = f(x) \).

Is the line \( y = x \) an oblique asymptote for the graph of \( f(x) \)? Choose the correct answer below.

- **A.** \( y = x \) is an oblique asymptote because \( \frac{9}{x} \to 0 \) as \( x \to \infty \) or \( x \to -\infty \).
- **B.** \( y = x \) is an oblique asymptote because \( f(x) \) is undefined for \( x = 0 \).
- **C.** \( y = x \) is not an oblique asymptote because \( \frac{9}{x} \) is undefined for \( x = 0 \).
- **D.** \( y = x \) is not an oblique asymptote because \( f(x) \to \infty \) as \( x \to \infty \) and \( f(x) \to -\infty \) as \( x \to -\infty \).

Summarize the pertinent information obtained by analyzing \( f(x) \).

**Domain:**
- **A.** The domain of \( f(x) \) is all real \( x \), except \( x = -9 \).
- **B.** The domain of \( f(x) \) is all real \( x \).
- **C.** The domain of \( f(x) \) is all real \( x \), except \( x = 0 \).
- **D.** The domain of \( f(x) \) is all real \( x \), except \( x = 9 \).

**Intercepts:**
- **A.** x-intercept: \( x = 0 \); y-intercept: \( y = 0 \).
- **B.** x-intercept: none; y-intercept: none.
- **C.** x-intercept: \( x = 0 \); y-intercept: \( y = 0 \).
- **D.** x-intercept: \( x = 0 \); y-intercept: \( y = 0 \).

**Asymptotes:**
- **A.** Horizontal asymptote: \( y = 0 \); Vertical asymptote: \( x = 0 \).
- **B.** Horizontal asymptote: none; Vertical asymptote: none.
- **C.** Horizontal asymptote: none; Vertical asymptote: \( x = 0 \).
- **D.** Horizontal asymptote: \( y = 0 \); Vertical asymptote: none.

Summarize the pertinent information obtained by analyzing \( f'(x) \).
8. (cont.)

- A. Decreasing on \((-\infty, -3)\) and \((3, \infty)\); Increasing on \((-3, 3)\).
- B. Increasing on \((-\infty, 0)\); Decreasing on \((0, \infty)\).
- C. Increasing on \((-\infty, -3)\) and \((3, \infty)\); Decreasing on \((-3, 3)\).
- D. Increasing on \((-\infty, -3)\) and \((3, \infty)\); Decreasing on \((-3, 0)\) and \((0, 3)\).

- A. There is a local minimum at \(x = -3\) and a local maximum at \(x = 3\).
- B. There is a local maximum at \(x = 0\).
- C. There are no local extrema.
- D. There is a local minimum at \(x = 0\).
- E. There is a local maximum at \(x = -3\) and a local minimum at \(x = 3\).

Summarize the pertinent information obtained by analyzing \(f''(x)\).

- A. \(f(x)\) is concave downward on \((-\infty, 0)\) and concave upward on \((0, \infty)\).
- B. \(f(x)\) is concave downward on \((-\infty, \infty)\).
- C. \(f(x)\) is concave upward on \((-\infty, 0)\) and concave downward on \((0, \infty)\).
- D. \(f(x)\) is concave upward on \((-\infty, \infty)\).

- A. There are no inflection points.
- B. There is an inflection point at \(x = 0\).
- C. There is an inflection point at \(x = -3\).
- D. There is an inflection point at \(x = 3\).

Now sketch the graph. Choose the correct answer below.
9. Summarize the pertinent information obtained by applying the graphing strategy and sketch the
graph of \( f(x) = \frac{x^2 + 4x - 12}{x^2 - 7x + 10} \). [Note: These rational functions are not reduced to lowest terms.]

Summarize the pertinent information obtained by analyzing \( f(x) \).

Domain:

- **A.** The domain of \( f(x) \) is all real \( x \).
- **B.** The domain of \( f(x) \) is all real \( x \), except \( x = 2 \).
- **C.** The domain of \( f(x) \) is all real \( x \), except \( x = 5 \).
- **D.** The domain of \( f(x) \) is all real \( x \), except \( x = 2 \) and \( x = 5 \).

Intercepts:

- **A.**
  - x-intercept: \( x = -6 \); y-intercept: \( y = -\frac{6}{5} \).
- **B.**
  - x-intercept: \( x = \frac{6}{5} \); y-intercept: \( y = -6 \).
- **C.**
  - x-intercept: \( x = -6 \) and \( x = 2 \); y-intercept: \( y = -\frac{6}{5} \).
- **D.**
  - x-intercept: \( x = -6 \) and \( x = 2 \); y-intercept: none.

Asymptotes:

- **A.** Horizontal asymptote: \( y = 1 \); Vertical asymptote: \( x = 2 \) and \( x = 5 \).
- **B.** Horizontal asymptote: none; Vertical asymptote: \( x = 2 \) and \( x = 5 \).
- **C.** Horizontal asymptote: \( y = 5 \); Vertical asymptote: \( x = 1 \).
- **D.** Horizontal asymptote: \( y = 1 \); Vertical asymptote: \( x = 5 \).

Summarize the pertinent information obtained by analyzing \( f'(x) \).

- **A.** \( f(x) \) is decreasing on \( (-\infty, 5) \) and increasing on \( (5, \infty) \).
- **B.** \( f(x) \) is decreasing on \( (-\infty, 5) \) and \( (5, \infty) \).
- **C.** \( f(x) \) is increasing on \( (-\infty, 5) \) and decreasing on \( (5, \infty) \).
- **D.** \( f(x) \) is increasing on \( (-\infty, 5) \) and \( (5, \infty) \).
9. (cont.)

- **A.** There is a local minimum at $x = 5$.
- **B.** There are no local extrema.
- **C.** There is a local maximum at $x = 5$.
- **D.** There is a local maximum at $x = 0$.
- **E.** There is a local minimum at $x = 0$.

Summarize the pertinent information obtained by analyzing $f''(x)$.

- **A.** $f(x)$ is concave upward on $(-\infty, 5)$ and concave downward on $(5, \infty)$.
- **B.** $f(x)$ is concave downward on $(-\infty, 5)$ and concave upward on $(5, \infty)$.
- **C.** $f(x)$ is concave upward on $(-\infty, \infty)$.
- **D.** $f(x)$ is concave downward on $(-\infty, \infty)$.

- **A.** There is an inflection point at $x = 0$.
- **B.** There are no inflection points.
- **C.** There is an inflection point at $x = 5$.
- **D.** There is an inflection point at $x = 2$.

Now sketch the graph. Choose the correct answer below.

- **A.**
- **B.**
- **C.**
- **D.**
1. $112x^{-9} - 648x^{-10}$

2. A, (−5, 250)

3. A, (−∞, ln5)
   A, (ln5, ∞)
   A, ln 5

4. A, (−∞, ∞)
   A, 6 − 6$\sqrt{3}$, 6, 6 + 6$\sqrt{3}$
   A, 432
   A, (−∞, 0), (12, ∞)
   A, (0, 12)
   A, 0
   A, 12
   A, (6, ∞)
   A, (−∞, 6)
   A, 6
   C

5. A

6. A, [−9, ∞)
   A, −9
   A, 3

7. A
   A
   D
   A
   A
   D
   D

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