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Question 1 **(1 pts)**

Suppose $\lim_{x\to\infty} f(x) = \infty$ and $\lim_{x\to\infty} g(x) = -\infty$. What is $\lim_{x\to\infty} f(x)g(x)$?

A. ∞

B. 0

C. $-\infty$

D. Does not exist.

Question 2 **(1 pts)**

What is $\infty - \infty$?

A. ∞

B. Does not exist.

C. 0

D. $-\infty$

Question 3 **(1 pts)**

When is a function f an odd function?

A. If $f(-x) = -f(x)$.

B. If $\lim_{x\to\infty} f(x) = -\infty$

C. If $f(-x) = f(x)$.

D. If $\lim_{x\to\infty} f(x)$ does not exist.

Question 4 **(1 pts)**

Suppose $f(x) = \frac{x}{x+1}$. Find the vertical and horizontal asymptotes.

A. Vertical asymptote at $y = 1$
Horizontal asymptote at $x = -1$

B. Vertical asymptote at $x = 1$
Horizontal asymptote at $y = -1$

C. Vertical asymptote at $x = -1$
Horizontal asymptote at $y = 1$

D. No vertical asymptote.
Horizontal asymptote at $y = -1$

Question 5 **(1 pts)**

$f(x) = \frac{x^2+4x}{x^2-16}$. Find the vertical asymptote(s).

A. $x = 16$

B. $x = -4$ and $x = 4$

C. There are no vertical asymptotes.

D. $x = 4$

Question 6 **(1 pts)**

Suppose we have a function $f(x) = \frac{x^4}{12} + x$, where $f''(x) = x^2$. What does $f''(x)$ tell us about the curve of $f(x)$?

A. $f''(x)$ will always be positive, so the graph of $f(x)$ is concave upward.

B. $f''(x)$ will always be negative, so the graph of $f(x)$ is concave upward.

C. $f''(x)$ will always be positive, so the graph of $f(x)$ is concave downward.

D. $f''(x)$ will always be negative, so the graph of $f(x)$ is concave downward.

Question 7 **(1 pts)**

Suppose $f'(x) < 0$ and $f''(x) > 0$ for some function $f(x)$. What does this tell us about the graph of $f(x)$?

A. $f(x)$ is decreasing and concave upward.

B. $f(x)$ is decreasing and concave upward.

C. Since they are opposite signs we can not conclude anything about $f(x)$.

D. $f(x)$ is decreasing and concave downward.

Question 8 **(1 pts)**

Give the function to optimize for the following problem:

Find the dimensions of a rectangle with perimeter 100m whose area is as large as possible.

A. $y = \frac{100-x}{2}$

B. $100 = 2x + 2y$

C. $A = x(50 - x)$

D. $A = xy$

Question 9 **(1 pts)**

Give the function to optimize for the following problem:

The sum of two positive numbers is 16. What is the smallest possible value of their squares?

A. $16 = x + y$

B. $16 = x^2 + y^2$

C. $S = x^2 + y^2$

D. $S = x^2 + (16 - x)^2$

Question 10 **(1 pts)**

Give the function to optimize for the following problem:

Find the dimensions of the rectangle of largest area that can be inscribed in a circle with radius r centered at the origin. (Both the circle and the recetangle are centered at the origin).

A. $A = xy$

B. $A = 4x\sqrt{r^2 - x^2}$

C. $A = \pi r^2$

D. $A = 4xy$