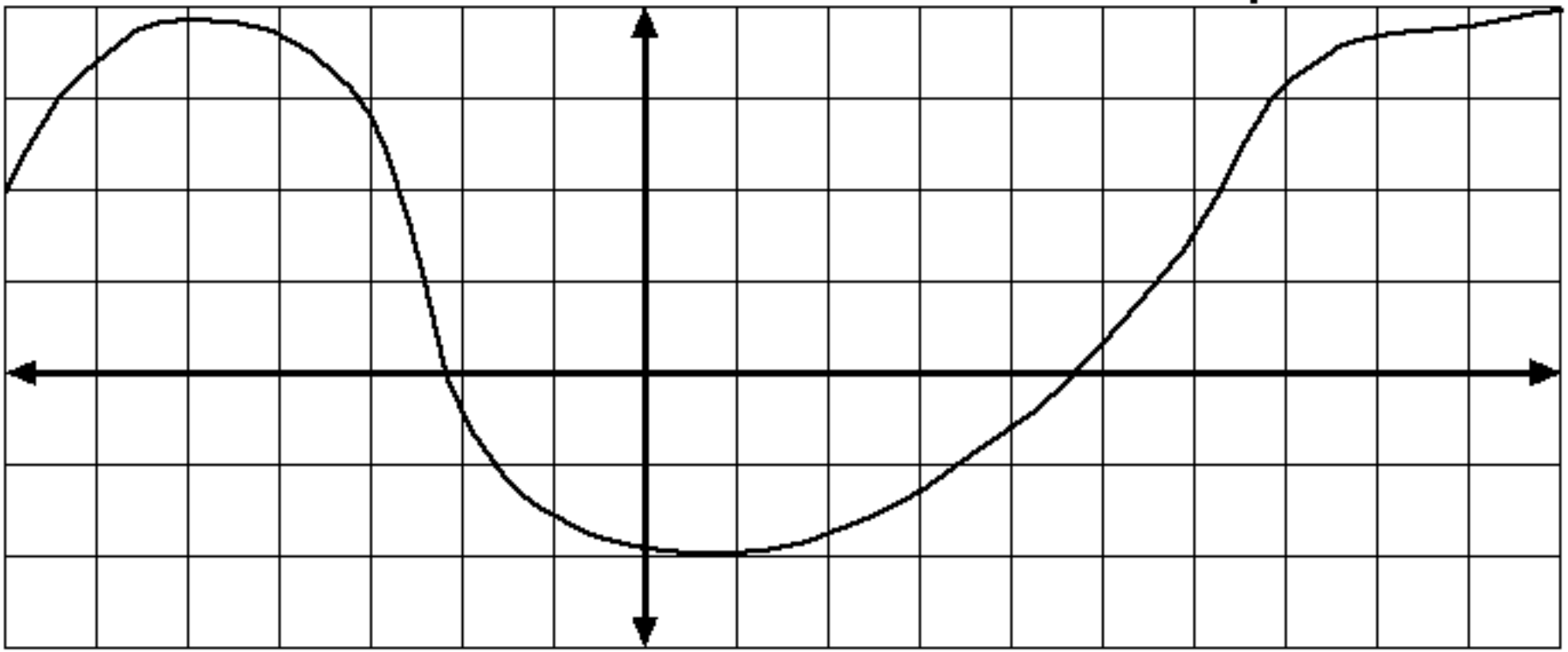
G1. For what values of x is the derivative positive?



G2. Sketch a graph where the first derivative is positive and the second derivative is negative.

G3. Draw a graph with a point where both the first and second derivatives are zero. Label that point.

G4. The derivative of a function is negative from $-\pi$ to 0, positive from 0 to π, negative from π to 2π, and positive from 2π to 3π. The second derivative is positive from $-\pi/2$ to $\pi/2$, negative from $\pi/2$ to $3\pi/2$, and positive from $3\pi/2$ to $5\pi/2$. What is this function?

W1. The sum of two numbers is 50. What is the maximum product of those two numbers?

W2. The product of two numbers is 24. What is the maximum sum?

W3. Find the point on the line $y = 2x - 4$ that is closest to the origin.

W4. The number of pizza slices sold (y) depends on price (x) according to the relationship $y = 200/x^2$. Each slice costs $0.75 to supply. What price would maximize profits?

U1. Find the vertex of the parabola $y = -2x^2 + 5x - 1$ using calculus.

U2. Find the maximum and minimum of the function $y = 1/3x^3 - 4x^2 + 15x - 3$ using calculus.

U3. The position (y) of an object over time (x) is described by $\mathbf{y = 2x^3 - x^2 + 6x - 1}$. When is the object accelerating and when is it decelerating?

U4. Find when the graph of

$$\mathbf{y = x^4 - 2x^3 + 5x^2 - 4}$$

has positive curvature and when it has negative curvature.

?1. Explain using calculus why a line has no maximum or minimum.

?2. Explain using calculus why a line has neither positive nor negative curvature. (hint: $y = mx + b$)

?3. The position of an object (y) over time (x) is described by $y = x^5 - 3x^4 + 5x^2 + 1$. How fast is the object **accelerating** after 3 seconds?

?4. Explain using calculus why a projectile travels in a parabolic path. (Hint: What's true about its acceleration?)

R1. Expand $(x + 1)^7$

R2. Find $\lim_{x \to \infty} \frac{x^5 + x^3 + 4x - 10}{x^5}$

R3. Find the derivative of

$$y = \frac{3}{x^7}$$

R4. Prove using the definition that the derivative of the function $y = 10x$ is 10.