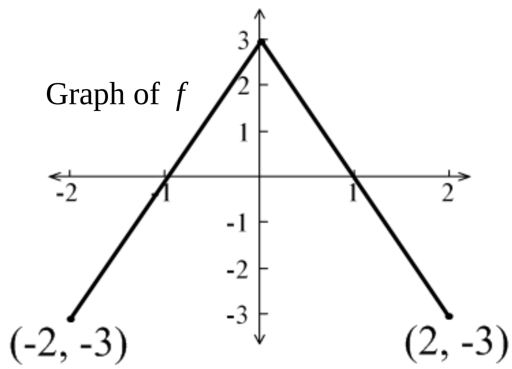
AP Calculus
Review #7 *name*________________________*p*____
Calculators are not allowed for these problems.

1. (*2002 exam, #4*) The graph of the function f shown below consists of two line segments. Let g be the function given by $g(x)=\int_0^x f(t)\,dt$.

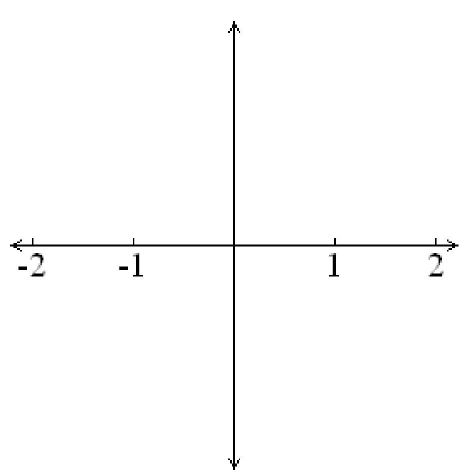


(a) Find $g(-1)$, $g'(-1)$, and $g''(-1)$.

(b) For what values of x in the open interval (-2, 2) is g increasing? Explain your reasoning.

(c) For what values of x in the open interval (-2, 2) is the graph of g concave down? Explain.

(d) On the axes provided, sketch the graph of g on the closed interval [-2, 2].



2. A cubic polynomial function f is defined by

$$f(x) = 4x^3 + ax^2 + bx + k$$

where a, b, and k are constants. The function f has a local minimum at $x = -1$, and the graph of f has a point of inflection at $x = -2$.

(a) Find the values of a and b.

(b) If $\int_0^1 f(x)\,dx = 32$, what is the value of k?

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3. The function f is differentiable for all real numbers. The point $\left(3, \frac{1}{4}\right)$ is on the graph of $y = f(x)$, and the slope at each point (x, y) on the graph is given by $\frac{dy}{dx} = y^2(6-2x)$.

(a) Find $\frac{d^2y}{dx^2}$ and evaluate it at the point $\left(3, \frac{1}{4}\right)$.

(b) Find $y = f(x)$ by solving the differential equation $\frac{dy}{dx} = y^2(6-2x)$ with the initial condition $f(3) = \frac{1}{4}$.