1. (10 pts) The graph of a function \( f(x) \) is given below. Sketch the graph of the function \( g(x) = -\frac{1}{2}f(x+2) + 1 \).
2. (15 pts) Find the points at which the function \( f(x) = x^3 - 9x^2 - 48x + 52 \) attains its local maximum, local minimum, and global maximum on the interval \((-3, 10)\), if they exist.

3. (10pt) Of all the cylinders with volume \( 8 \text{cm}^3 \) what are the dimensions of the one which has the maximum surface area. (No need to simplify your answer.)
4. (15 pts) The graph of a function \( g(x) \) is given below.

(a) Sketch the graph of its antiderivative.

(b) Sketch the graph of \( g' \), the derivative of \( g \).
5. (20 pts) Determine whether the statements below are true or false. Explain your answer. CORRECT ANSWERS WITHOUT ANY JUSTIFICATION WILL NOT GET CREDIT.

(a) The area under the curve $f(x) = \frac{1}{1+x^2}$ and above the x-axis is infinite.

(b) The graph of the function $f(x) = x^4 - x^3$ changes from being concave up to concave down at $x = 0$.

(c) The function $f(x) = \begin{cases} x \sin(\frac{1}{x}) & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$ is continuous at $x = 0$.

(d) Let $f$ be a differentiable function such that $f(1) = 1$ and $f'(1) = 2$. Then the best linear approximation to $f$ at $x = 1$ is $g(x) = 1 + 2x$. 
6. (30 pts) Evaluate the following:

(a) \( \lim_{x \to \infty} \frac{e^x + x^2}{2e^x + x} \)

(b) \( \lim_{x \to 0} \frac{\cos(x) - 1}{x^2} \)

(c) \( \frac{d}{dx} (\sin(\cos(x))) \)

(d) \( \int x \sin(x) \, dx \)

(e) \( \int \frac{e^t + 1}{e^t + t} \, dt \)

(f) \( \frac{d}{dx} \int_0^x \tan(y) \, dy \)