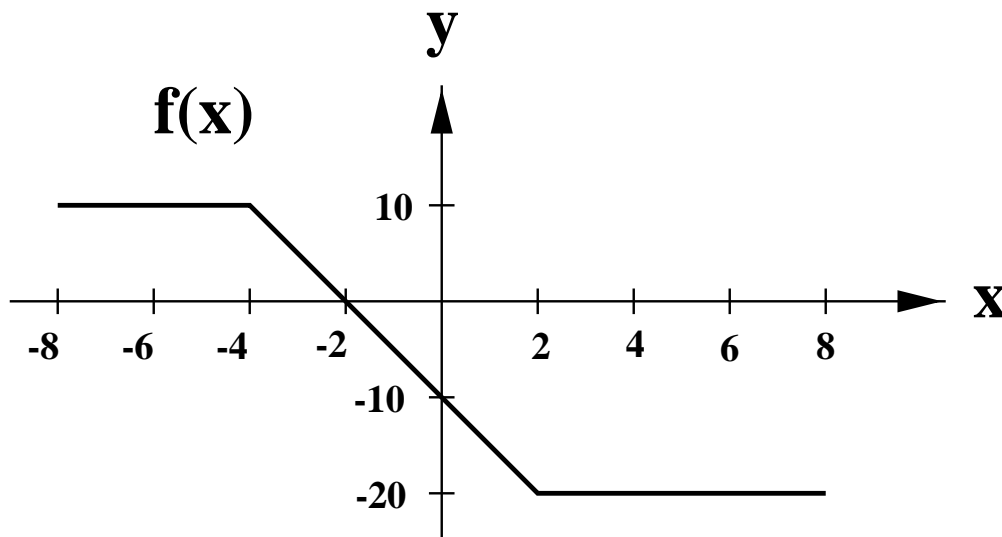


Name _____

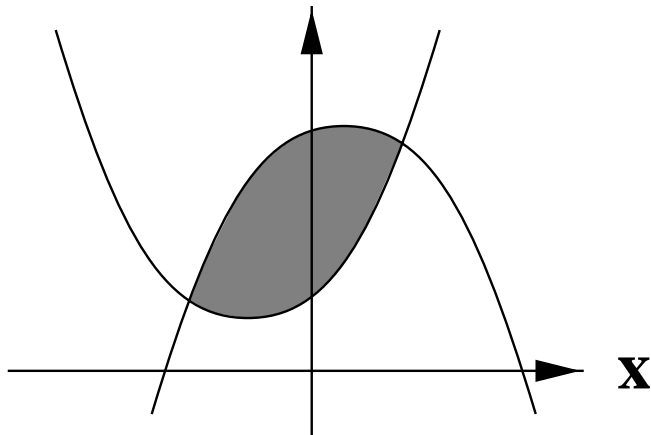
RULES FOR THIS TEST:

- Do not borrow another student's calculator.
 - Circle each final answer.
 - A correct answer will only be given full credit if enough work is shown to justify that answer.
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1. (7 points) Using the graph of $f(x)$ shown below, compute the exact value of $\int_{-8}^8 f(x) dx$.



2. (13 points) The graphs of $f(x) = 3 + 2x + x^2$ and $g(x) = 9 + x - x^2$ are sketched below and the area between the two curves is shaded in. Using proper mathematical terminology, write down the definite integral which represents this shaded area. Now evaluate your definite integral to determine this area. Your answer should be accurate to at least two decimal places after the decimal point.



3. (15 points) Due to a terrible storm, the water in a river is rising. The people in a nearby town are worried that flooding will occur. They have sandbags along both sides of the river which will stop the flooding as long as the total rise in the water-level is less than 15 inches. The rate at which the water is rising is decreasing until the storm finally stops 24 hours later, and is recorded every 6 hours in the table below.

# hours	0	6	12	18	24
# inches per hour	2.0	1.2	0.6	0.2	0

- (a) By calculating a left Riemann sum, a right Riemann sum, and then averaging these two values, give 3 estimates for the number of inches that the water-level of the river rises during this 24-hour period. For your Riemann sums you should use $\Delta t = 6$.

- (b) Do you have enough information to determine whether or not the town will flood during this 24-hour period? A simple **yes** or **no** answer will not be given any credit unless you clearly justify that answer.

4. (15 points) Gasoline has been leaking out of an underground storage tank at a rate of $300(0.95)^t$ gallons per week, where t represents the number of weeks since the leak started. How many gallons of gasoline leaked out of the tank during the first ten weeks of leakage?

5. (32 points) Find derivatives of each of the following functions. Be sure to use correct variable names and proper terminology when referring to the derivative.

(a) $f(x) = 3x^{10} - \frac{1}{x^3}$

(b) $w = \ln(x^3 + 5x^2 - 12)$

(c) $y = 3^t + \ln t$

(d) $g(t) = te^{-t}$

6. (8 points) Find the equation of the line tangent to the graph of $f(x) = 5e^{2x}$ at $x = 0$.

7. (10 points) The Red-Cockaded Woodpecker is a bird which was put on the endangered species list in 1970. Suppose that the population of these birds is approximated by $f(t) = 10000e^{-0.01t}$, where t is measured in years since 1970.

(a) Approximately how many of these woodpeckers are living today, 31 years later?

(b) How quickly is the population decreasing today?