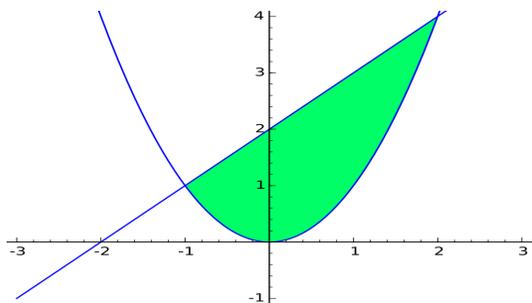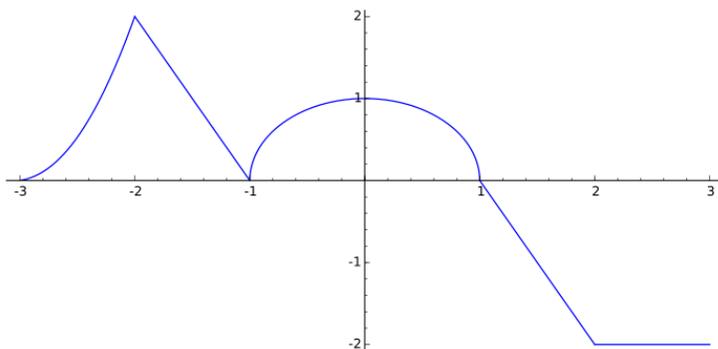## Instructions

1. **No calculators, cell phones, or other electronic devices are allowed during this exam.**

2. **You may use one page (8.5 by 11 inches) of handwritten notes.**

3. **Read each question carefully, and answer each question completely. Do as much as you can if you cannot complete a problem.**

4. **Write solutions clearly in your Blue Book**

   (a) **Indicate the number and letter of each question you are answering.**

   (b) **Answer the questions in the order that they appear on the exam.**

   (c) **Start each question on a new page.**

5. **Show all of your work. No credit will be given for correct answers that have no supporting work.**

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0. (1 point) Write your name, PID, and section number or time on the front of your Blue Book. Draw the table on the board on the top right corner of the front of your Blue Book.

1. (6 points) Calculate the shaded area between the two curves $y = x + 2$ and $y = x^2$.

2. (6 points) A bug travels with velocity given by $v(t) = \sin t$.

   (a) Calculate the bug's change in position from time $t = 0$ to time $t = 2\pi$.

   (b) Calculate the bug's total distance traveled from time $t = 0$ to time $t = 2\pi$.

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3. (8 points) Let $y = g(x)$ be given by the graph above (the curved part between $-1 \le x \le 1$ is a half circle). Assume $\int_{-3}^{-2} g(x)\,dx = 1$. Evaluate the following integrals:

(a) $\int_{-2}^{-1} g(x)\,dx$

(b) $\int_{-2}^{-2} g(x)\,dx$

(c) $\int_{-3}^{3} g(x)\,dx$

(d) What is the average value of $g(x)$ on $-3 \le x \le 3$?

4. (8 points) Let $f(x)$ be an **odd** function with $\int_{0}^{2} f(x)\,dx = -4$ and $\int_{-3}^{-2} f(x)\,dx = 2$. Let $F(x)$ be an antiderivative of $f(x)$ with $F(0) = 5$ and $F(6) = 10$. Evaluate the following:

(a) $\int_{-3}^{2} f(x)\,dx$

(b) $\int_{-3}^{0} f(x)\,dx$

(c) $F(2)$

(d) $F(-6)$

5. (6 points) Let $h(x)$ be an increasing function where $h(0) = 2$ and $h(8) = 10$. Explain why
$$16 \le \int_{0}^{8} h(x)\,dx \le 80.$$