

Name: \_\_\_\_\_ PID: \_\_\_\_\_

- Print your *NAME* on every page and write your *PID* in the space provided above.
  - Show all of your work in the spaces provided. No credit will be given for unsupported answers, even if correct.
  - No calculators, tablets, phones, or other electronic devices are allowed during this exam. You may use one page of handwritten notes, but no books or other assistance.
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- (1 pt) 0. Follow the instructions on this exam and any additional instructions given during the exam.
- (6 pt) 1. Let  $f(x) = \frac{1}{x} + x - x^3$  defined on the interval  $(-\infty, 0)$ .
- (a) Find the most general antiderivative of  $f$  on the interval  $(-\infty, 0)$ .
  - (b) Find the antiderivative  $F(x)$  on the interval  $(-\infty, 0)$  that satisfies  $F(-1) = \frac{3}{4}$ .

(8 pt) 2. Evaluate the integrals.

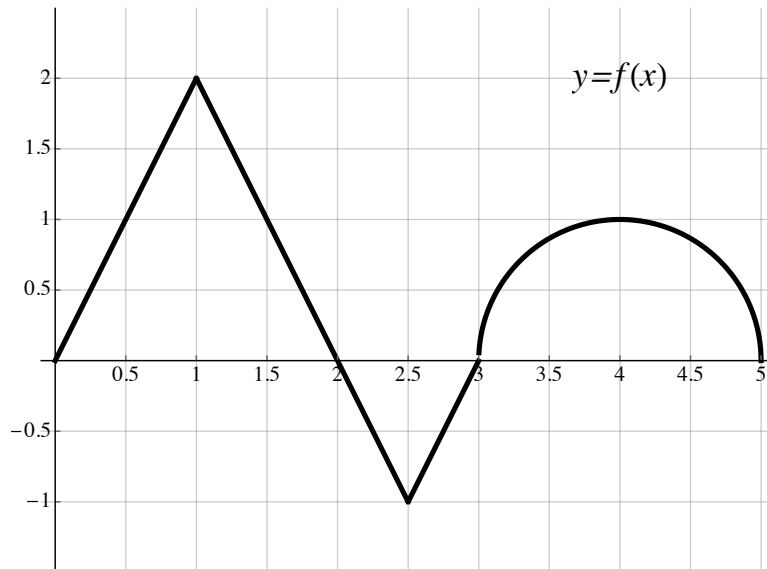
(a)  $\int_0^1 (x^2 + 1)(\sqrt{x} - 2) dx$

(b)  $\int_{-5}^2 |2x + 4| dx$

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- (6 pt) 3. A particle moves along a straight line so that its acceleration at time  $t$  is  $a(t) = 2 \cos(t)$  ft/sec<sup>2</sup>. Suppose the initial velocity of the particle is 0 ft/sec.
- (a) At what time during the interval  $0 < t < 2\pi$  does the particle change direction?
  - (b) Find the total distance traveled during  $0 \leq t \leq 2\pi$ .

(8 pt) 4. Let  $F(x) = \int_0^x f(t) dt$ , where the graph of  $f$  is given below.



(a) Fill in the following table of values of  $F(x)$ .

$F(0)$	$F(1)$	$F(2)$	$F(3)$	$F(5)$

(b) Suppose the domain of  $F$  is  $[0, 5]$ . List all intervals where  $F$  is increasing.

(c) Evaluate the integral  $\int_2^5 f(x) dx$

(d) Evaluate the integral  $\int_2^0 f(x) dx$

(6 pt) 5. Suppose that  $f$  is a continuous function for which

$$\int_1^{x^2} f(t) dt = e^x \ln(x)$$

for all  $x > 0$ . Find the value of  $f(1)$ .