

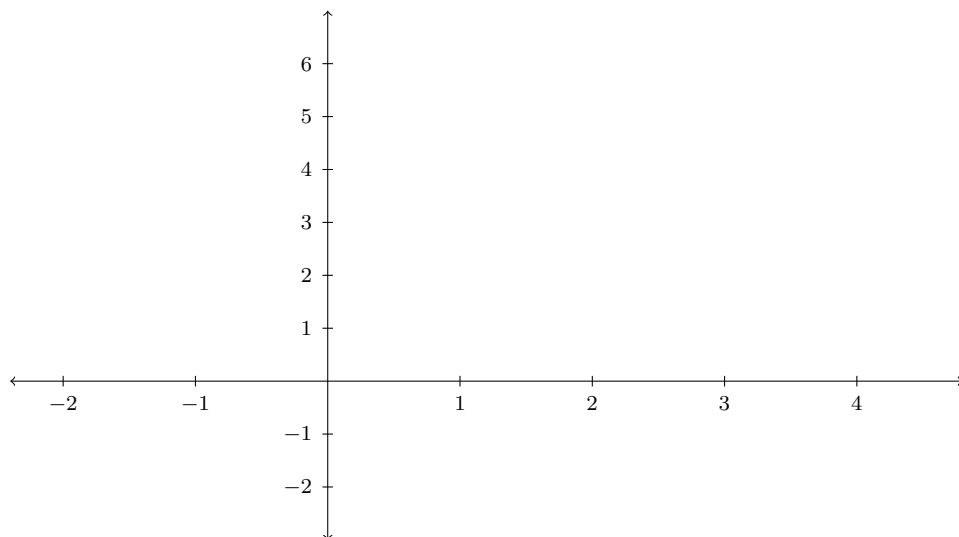
No books, notes, **or calculators**. Cross out what you do not want us to grade. You **must** show work to receive full credit. Please try to write neatly. You need not simplify your answers unless asked to do so. You should evaluate standard trigonometric functions like  $\tan(\pi/3)$ . You **may not** use reduction formulas. You are required to **sign** your exam book. With your signature, you pledge that you have neither given nor received assistance on this exam.

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Problem	Point Value	Points
1	8	
2	10	
3	10	
4	10	
5	10	
6	10	
7	16	
8	10	
9	16	
	100	

1. (8 points) Let  $R$  be the region bounded by the curve  $y = 6 - x^2$ , the  $x$ -axis and the lines  $x = 1$  and  $x = 2$ .

(a) Sketch the region  $R$  and the vertical line  $x = 4$ .



(b) Set up but *do not evaluate* an expression that gives the volume of the solid obtained by rotating the region  $R$  about the vertical line  $x = 4$ .

Evaluate the following integrals. **Do not simplify your answers.**

2. (10 points)  $\int \frac{\sin^3 x}{\sqrt{\cos x}} dx$

3. (10 points)  $\int_2^4 x \ln(x) dx$

4. (10 points)  $\int \sqrt{4 - x^2} dx$

5. (10 points)  $\int \tan^3(2x) \sec(2x) dx$

6. (10 points)  $\int \frac{7x^2 + x + 3}{x^3 + x^2} dx$

7. (16 points) Determine if the following improper integrals converge or diverge. Evaluate if the integral converges.

(a)  $\int_0^{\infty} x e^{-x^2} dx$

(b)  $\int_0^4 \frac{dx}{\sqrt[3]{8-2x}}$

8. (10 points) Solve for  $y$  in the following initial value problem. Show all work.

$$\frac{dy}{dt} = 2y - 6, \quad y(0) = 8.$$

9. (16 points)

(a) Let  $a_{n+1} = 2a_n$ ,  $n \geq 0$ ,  $a_0 = 3$ .

(i) Write down the first 4 terms of the sequence.

(ii) Write down an explicit formula for the sequence.

(b) Find the limit of the following sequences or state that the limit does not exist.

(i)  $a_n = ne^{-2n}$

(ii)  $a_n = \left(\frac{3}{n}\right)^{\frac{1}{n}}$



Name \_\_\_\_\_

Section \_\_\_\_\_

Instructor \_\_\_\_\_

I pledge that I have neither given nor received assistance on this exam.

Signature \_\_\_\_\_