

### Practice Test B for Midterm Exam 3

**Instructions:** This optional exam is for practice, to give you an idea of what our in-class midterm exam will be like. I'd recommend that you try taking it in exam conditions: 50 minutes, closed-book.

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1. **(10 points)** Find a function  $f(x)$  such that  $f(1) = 3$ ,  $f'(1) = 5$ , and  $f''(x) = 12x^2 + 12x$ .

2. **(25 points)** Let  $f(x) = \frac{2x^3 + 45x^2 + 315x + 600}{x^3}$ . Take my word for it that

$$f'(x) = \frac{-45(x+4)(x+10)}{x^4}, \quad \text{and} \quad f''(x) = \frac{90(x+5)(x+16)}{x^5}.$$

Sketch the graph of  $y = f(x)$ , clearly indicating **horizontal and vertical asymptotes**, **local extrema**, **inflection points**, and **intervals of increase and decrease and of concavity**.

You do **not** need to indicate locations of intercepts or  $y$ -coordinates of extrema or inflection points.

Also, please do **NOT** try to draw your graph to scale.

3. **(15 points)** Let  $g(x) = 4x^5 - 5x^4 - 40x^3$ . Find all critical points of  $g$  in  $(-\infty, \infty)$ , and classify each as a local maximum, local minimum, or neither.

4. **(25 points)** A rectangular poster is to contain  $50 \text{ in}^2$  of printed matter with margins of 4 inches at each of the top and bottom, and margins of 2 inches on each side. What are the height and width of the poster fitting those requirements that has the smallest possible area?

5. **(10 points)** Here are some values of a certain continuous function  $h(x)$ :

$x$	-4	-3	-2	-1	0	1	2	3	4	5	6
$h(x)$	3	1	0	-1	-2	-2	0	1	5	8	7

Estimate  $\int_{-3}^5 h(x) dx$  using **four** approximating rectangles of equal width and **right** endpoints. That is, compute  $R_4$ .

6. **(15 points)** Compute the following definite and indefinite integrals.

(a)  $\int (5 \sec t + 7 \tan t) \sec t dt$

(b)  $\int_{-1}^2 x^3(x+3)^2 dx$