# Midterm #3

**MATH 125 — Calculus 1**
**Tuesday, April 16**

***Please print your name:***

Besides the allowed calculator, no notes or tools of any kind are permitted. There are 25 points in total.

**Good luck!**

**Problem 1. (4 points)** Compute the following indefinite integrals. [No need to show work here.]

(a) $\int [x^4 - 2x^2 + 7]\,\mathrm{d}x =$

(b) $\int \left(\frac{1}{\sqrt{x}} + \frac{1}{x^3}\right)\mathrm{d}x =$

(c) $\int \frac{1}{1+x^2}\,\mathrm{d}x =$

(d) $\int [\sin(4x) + 3e^{2x}]\mathrm{d}x =$

**Problem 2. (2 points)** Compute $\int_1^2 x^2 \mathrm{d}x$. [Show your work!]

**Problem 3. (2 points)** Compute $\int_1^3 \frac{1}{x}\mathrm{d}x$. [Show your work!]

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**Problem 4. (2 points)** Compute: $\lim_{x \to 0} \frac{\sin(3x)}{e^{2x} - e^{7x}}$ [Show your work!]

**Problem 5. (2 points)** Compute: $\lim_{x \to 0^+} x^2 \ln(x)$. [Show your work!]

**Problem 6. (2 point)** Compute: $\sum_{k=2}^{4} \frac{(-2)^k}{k-1}$ [Show your work!]

**Problem 7. (3 points)** Let $A$ be the (net) area between the $x$-axis and $f(x)$ for $x$ in $[1, 5]$.

(a) Write down a Riemann sum for $A$ using 3 intervals (of equal size) and midpoints.

(b) Using sigma notation, write down a Riemann sum for $A$ using $n$ intervals (of equal size) and midpoints.

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**Problem 8. (4 points)** Suppose you have 100 m of fencing and want to fence off a rectangular field that borders a straight river (no fence is needed alongside the river). What is the maximum area you can fence off?

**Problem 9. (4 points)**

(a) Estimate the average value of $f(x) = x^2$ on $[0, 2]$ using a Riemann sum with 3 intervals and midpoints.

(b) Compute the (exact) average value of $f(x) = x^2$ on $[0, 2]$.

(extra scratch paper)