Math 124 I - Winter 2007
Mid-Term Exam Number One
January 30, 2007

Name: ───────────────────────────   Section: ──────────────

1	10	
2	16	
3	10	
4	10	
5	10	
6	10	
7	10	
Total	76	

- Complete all questions.

- You may use a scientific calculator during this examination; graphing calculators and other electronic devices are not allowed and should be turned off for the duration of the exam.

- If you use trial-and-error, a guess-and-check method, or numerical approximation when an exact method is available, you will not receive full credit.

- You may use one double-sided, hand-written, 8.5 by 11 inch page of notes.

- Show all work for full credit.

- You have 80 minutes to complete the exam.

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1. A particle is moving in the plane so that its location at time t is given by the parametric equations

$$x = 4 - 2t, \; y = 5 + t$$

Determine the time when the particle is closest to the point $(3, 2)$.

2. Evaluate each of the following limits. Show all work.

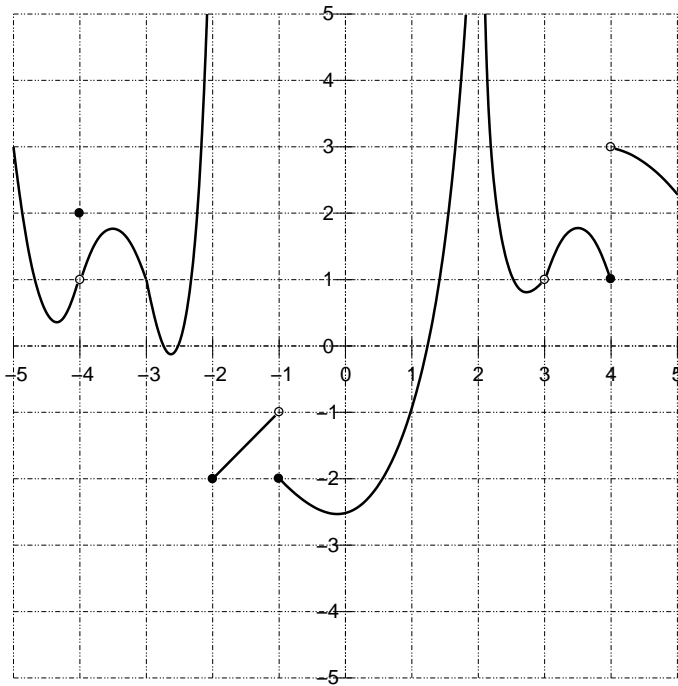(a) $\displaystyle\lim_{x\to 2} \frac{x^2 + x - 6}{x^2 - 7x + 10}$

(b) $\displaystyle\lim_{x\to 0^-} \frac{|x| - x}{x}$

(c) $\displaystyle\lim_{x\to\infty} \left(\sqrt{9x^2 + 7x} - 3x\right)$

(d) $\displaystyle\lim_{x\to 2^+} \frac{x(x+1)(x-4)}{(x-2)^2}$

3. Find the equation of the tangent line to the curve $y = x^2 - 3x$ at the point $(1, -2)$.

4. The graph of $f(x)$ for $-5 \le x \le 5$ is shown below.

(a) What is $\lim\limits_{x \to -4} f(x)$?

(b) Is $f(x)$ continuous at $x = -4$?

(c) What is $\lim\limits_{x \to -2} f(x)$?

(d) What is $\lim\limits_{x \to -1^-} f(x)$?

(e) Is $f(x)$ continuous at $x = 3$?

(f) What is $\lim\limits_{x \to 4^+} f(x)$?

5. For what values of c is the following function continuous at $x = 1$?

$$f(x) = \begin{cases} (x - c)^2 & \text{if } x < 1, \\ 13 - cx & \text{if } x \geq 1 \end{cases}$$

6. Let $f(t)$ be defined as follows:

$$f(t) = 10 \sin\left(\frac{\pi t^2 + t}{6t^2 + 8t + 3}\right) + \frac{\sin(t - 10)}{2t - 20} + 85$$

Find $\lim_{t \to \infty} f(t)$.

7. For a certain function $f(x)$,

$$\frac{f(x+h) - f(x)}{h} = \frac{3hx^2 + (3h^2 - 6h)x + (h^3 - 3h^2 + 2h)}{h}$$

Find the slope of the tangent line to $y = f(x)$ at $x = 3$.