

Name: _____

Instructor: _____

Math 10550, Supplemental Problems Exam 3
November 15, 2011

- The Honor Code is in effect for this examination. All work is to be your own.
- No calculators.
- The exam lasts for 1 hour and 15 min.
- Be sure that your name is on every page in case pages become detached.
- Be sure that you have all 2 pages of the test.

PLEASE MARK YOUR ANSWERS WITH AN X, not a circle!

Please do NOT write in this box.

Multiple Choice _____

2. _____

Total _____

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Multiple Choice

1.(6 pts.) Evaluate $\lim_{x \rightarrow -\infty} \frac{\sqrt{4x^6 + 5}}{x^3 + 1}$.

- (a) -2 (b) 2 (c) 6 (d) $3/2$ (e) 4

Solution: We first divide through by x^3 , in the numerator using the fact that $\sqrt{x^6} = -x^3$ for $x < 0$:

$$\frac{\sqrt{4x^6 + 5}}{x^3 + 1} = -\frac{\sqrt{4 + 5/(x^6)}}{1 + 1/(x^3)}.$$

As x goes to $-\infty$, the numerator goes to $\sqrt{4} = 2$. As x goes to $-\infty$, the denominator goes to 1. Hence the answer is -2 .

2.(10 pts.) The velocity of a particle (in meters per second) is given by

$$v(t) = 12 + 6t - 6t^2.$$

- (a) What is the **displacement** of the particle over the interval $[0, 3]$?
(b) What is the **distance** traveled by the particle over the interval $[0, 3]$?

Solution

The displacement of the particle over the interval $[0, 3]$ is

$$\begin{aligned} \int_0^3 v(t) dt &= \int_0^3 12 + 6t - 6t^2 dt \\ &= (12t + 3t^2 - 2t^3)|_0^3 = 36 + 27 - 54 = 9. \end{aligned}$$

The distance traveled by the particle over the interval $[0, 3]$ is $\int_0^3 |v(t)| dt$.

$$v(t) = 12 + 6t - 6t^2 = -6(-2 - t + t^2) = -6(t - 2)(t + 1).$$

So $v(t) \geq 0$ for $0 \leq t \leq 2$ and $v(t) \leq 0$ for $2 \leq t \leq 3$. Thus

$$\begin{aligned} \int_0^3 |v(t)| dt &= \int_0^2 v(t) dt + \int_2^3 -v(t) dt \\ &= \int_0^2 12 + 6t - 6t^2 dt + \int_2^3 -12 - 6t + 6t^2 dt \\ &= (12t + 3t^2 - 2t^3)|_0^2 + (-12t - 3t^2 + 2t^3)|_2^3 \\ &= 20 + 11 = 31. \end{aligned}$$

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