Name: _____

Instructor: _____

Math 10550. Exam 2 (Practice)

- 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 13 pages of the test.

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

1.	(a)	(b)	(c)	(d)	(e)
2.	(a)	(b)	(c)	(d)	(e)
3.	(a)	(b)	(c)	(d)	(e)
4.	(a)	(b)	(c)	(d)	(e)
5.	(a)	(b)	(c)	(d)	(e)
6.	(a)	(b)	(c)	(d)	(e)
7.	(a)	(b)	(c)	(d)	(e)
8.	(a)	(b)	(c)	(d)	(e)

Please do NOT write in this box.

Multiple Choice_____

9. _____

10. _____

11. _____

12. _____

Total _____

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Multiple Choice

1.(7 pts.) Starting at time $t = 0$ a particle is oscillating vertically. After t minutes the height of the particle above ground (*in feet*, upward is positive) is given by

$$10\cos(\pi t).$$

Which one of the statements below is correct when $t = 0.25$ minutes? (*Only one is*)

(a) The particle is below ground, ascending and slowing down.

(b) The particle is below ground, descending and speeding up.

(c) The particle is above ground, descending and speeding up.

(d) The particle is above ground, descending and slowing down.

(e) The particle is above ground, ascending and slowing down.

2.(7 pts.) Let f be a function which is continuous on the interval $[0, 18]$ and differentiable on $(0, 18)$. If $f(0) = 1$ and

$$|f'(x)| \leq 2 \quad \text{for all} \quad x \in (0, 18),$$

which statement below **must** be true? (*only one must be*, the remaining ones ***might*** be false)

(a) $|f(4)| \leq 2$

(b) $f(x) = 1 + 2x$

(c) $-1 \leq f(4) \leq 3$

(d) $-7 \leq f(4) \leq 9$

(e) $f'(4) = 2$

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3.(7 pts.) If $f'(x) = \dfrac{(x-1)^2 x}{(x+1)^3}$, find the local maxima and minima of $f(x)$ assuming that the domain of $f(x)$ is all $x \neq -1$. (Note: you are given f', not f.)

(a) f has a local minimum at $x = 0$; there is no local maximum

(b) f has a local minimum at $x = 1$; f has a local maximum at $x = -1$

(c) f has a local minimum at $x = 0$; f has local maxima at $x = 1$ and $x = -1$

(d) f has a local minimum at $x = 0$; f has a local maximum at $x = 1$

(e) There are no local minima or local maxima

4.(7 pts.) . Evaluate $\lim\limits_{x \to -\infty} \dfrac{\sqrt{4x^6 + 5}}{x^3 + 1}$.

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

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5.(7 pts.) How many inflection points does the curve $y = 4x^5 - 5x^4 - 12$ have?

(a) 2 (b) 3 (c) None (d) 4 (e) 1

6.(7 pts.) Suppose $f(x)$ is continuous and differentiable for all real numbers. If $-1 \leq f'(x) \leq 3$ and $f(5) = 6$, what is the largest $f(x)$ can be at $x = 1$?

(a) -6 (b) 10 (c) 2 (d) 11 (e) 18

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7.(7 pts.) Find the linearization $L(x)$ of the function $f(x) = (3x + 125)^{1/3}$ at $a = 0$

(a) $\frac{1}{5}x + 5$

(b) $\frac{3}{25}x + \frac{1}{25}$

(c) $\frac{1}{25}x - 5$

(d) $\frac{3}{25}(x - 1) + 5$

(e) $\frac{1}{25}x + 5$

8.(7 pts.) Use the linear approximation (or tangent line approximation) of $f(x) = \cos(x)$ at $x = \pi/2$ to find approximate value of $f(x)$ at $x = 3\pi/5$.

(a) $\frac{\pi}{5}$ (b) $-\frac{1}{10}$ (c) $\frac{\pi}{10}$ (d) $-\frac{\pi}{10}$. (e) $-\frac{1}{7}$

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Partial Credit

You must show your work on the partial credit problems to receive credit!

9.(11 pts.) First answer the 8 questions below. Then use your answers to graph $y = x + 2\cos x$ on the interval $[0, 2\pi]$. ($\pi \approx 3.14, \sqrt{2} \approx 1.41, \sqrt{3} \approx 1.73$)

1a) $y' =$

1b) On what interval(s) is y decreasing?

1c) Give both coordinates of any local maxima.

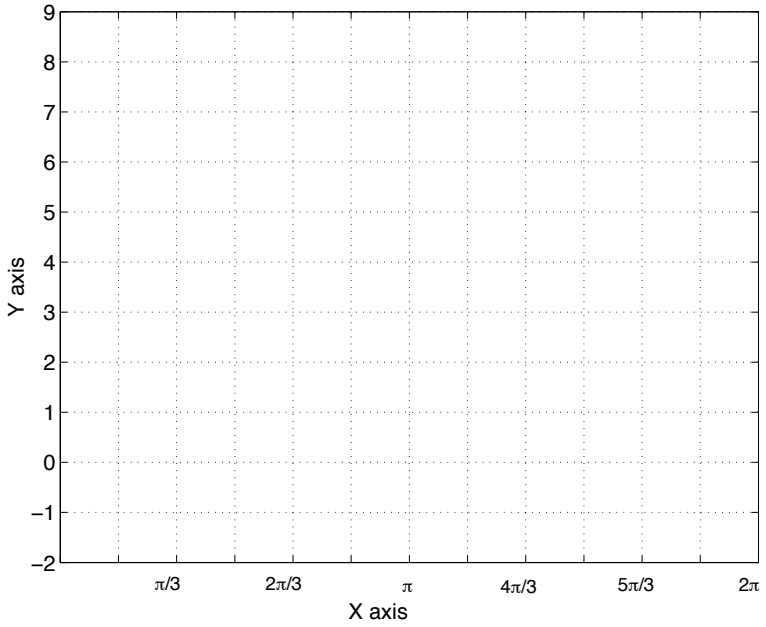
1d) Give both coordinates of any local minima.

2a) $y'' =$

2b) On what interval(s) is y concave down?

2c) Give both coordinates of any points of inflection.

2d) Give the slope of the tangent line at any points of inflection.



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10.(10 pts.) Find the extreme values of $f(x) = 3|x| - x^2 - 2$ on $-1 \leq x \leq 2$.

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11.(10 pts.) At noon ship A is 8 km west from ship B. Ship A is sailing south at 4 km/h and ship B is sailing north at 2km/h. How fast is the distance between the ships changing at 1p.m.?

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12.(10 pts.) Show that

$$2x - \sin(x) + x^3 + 2 = 0$$

has one and exactly one solution. Identify the theorem(s) you are using.

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Math 10550, Exam I
November 10, 2013

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