Name: ______________________________

Instructor: __________________________

**Math 10550, Exam 3**
**November 20, 2014.**

.

- 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 10 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) |
| 9. | (a) | (b) | (c) | (d) | (e) |
| 10. | (a) | (b) | (c) | (d) | (e) |

**Please do NOT write in this box.**

**Multiple Choice** ______________

11. ______________

12. ______________

13. ______________

14. ______________

Total ______________

Name: ____________________________

Instructor: ________________________

## Multiple Choice

**1.**(6 pts.) Find the equation of the slant asymptote to the function

$$f(x) = \frac{3x^3 + 2x^2 + 5x + 2}{x^2 + 1}$$

(a) $y = x + 4$ (b) $y = 3x + 4$ (c) $y = \frac{x}{3} + 2$

(d) $y = 3x + 2$ (e) $y = x + \frac{3}{2}$

**2.**(6 pts.) Calculate the indefinite integral

$$\int \frac{x + \sqrt[5]{x}}{x}\, dx$$

(a) $1 + 5\sqrt[5]{x} + C$ (b) $1 + \frac{5x^{9/5}}{9} + C$

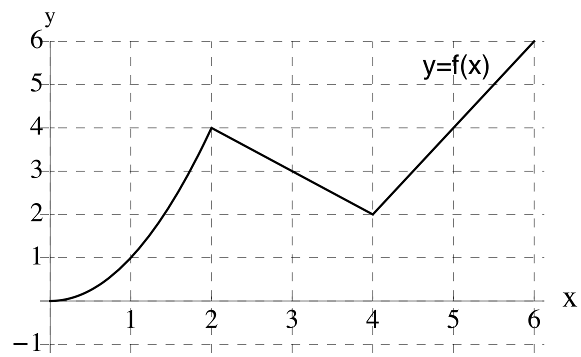
(c) $x + \frac{5x^{9/5}}{9} + C$ (d) $-\frac{4x^{-(9/5)}}{5} + C$

(e) $x + 5\sqrt[5]{x} + C$

Name: ____________________________

Instructor: ________________________

**3.**(6 pts.) Estimate the area under the graph of $y = f(x)$ between $x = 0$ and $x = 6$ using the Riemann sum which gives the right end point approximation with 6 approximating rectangles whose bases are of equal length (i.e. use $R_6$).




(a) $R_6 = 10$ (b) $R_6 = 14$ (c) $R_6 = 20$

(d) $R_6 = 18$ (e) $R_6 = 22$

**4.**(6 pts.) In finding the approximate solution to

$$x^3 - 4$$

using Newton's method with initial approximation $x_1 = 1$, what is $x_3$?

(a) $2$ (b) $\frac{7}{3}$ (c) $\frac{5}{4}$ (d) $-2$ (e) $\frac{5}{3}$

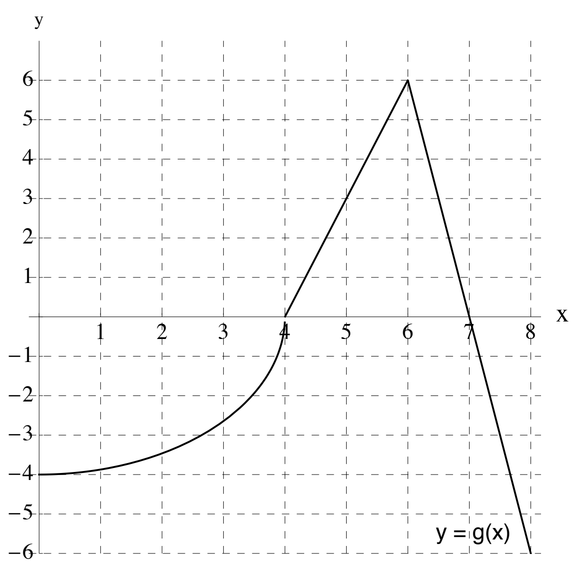
Name: ______________________________

Instructor: ___________________________

**5.**(6 pts.) A ball is thrown upwards from a height of 20 feet above the surface of the planet Minerva with an initial velocity of 6 feet per second (at time $t = 0$). The ball has a constant acceleration of $-2$ ft/sec$^2$. What is the maximum height (from the surface of the planet) reached by the ball?

(a) 32 ft (b) 24 ft. (c) 29 ft. (d) 65 ft. (e) 45 ft.

**6.**(6 pts.) The graph of the piecewise defined function $g(x)$ is shown below. The graph consists of part of a circle and straight lines. Use the graph to calculate $\int_0^8 g(x)\, dx$.




(a) $12 + 8\pi$ (b) $6 - 4\pi$ (c) $6 - 8\pi$

(d) $12 + 4\pi$ (e) $9 - 4\pi$

Name: ______________________________

Instructor: __________________________

**7.**(6 pts.) Let

$$h(x) = \int_1^{x^2} \frac{1}{4+\sin^2(t)}\, dt.$$

Find $h'(x)$.

(a) $\dfrac{2x}{4+\sin^2(x^2)}$ (b) $\dfrac{2\sin(x)\cos(x)}{4+\sin^2(x^2)}$ (c) $\dfrac{1}{4+\sin^2(x)}$

(d) $\dfrac{-2\sin(x)\cos(x)}{(4+\sin^2(x))^2}$ (e) $\dfrac{1}{4+\sin^2(x^2)}$

**8.**(6 pts.) Calculate the indefinite integral

$$\int \frac{x+\sin(\sqrt{x})}{\sqrt{x}}; dx.$$

(a) $\dfrac{2x^{3/2}}{3} + \dfrac{\cos(\sqrt{x})}{\sqrt{x}} + C$

(b) $\dfrac{2x^{3/2}}{3} - \dfrac{\cos(\sqrt{x})}{\sqrt{x}} + C$

(c) $\dfrac{2x^{3/2}}{3} - 2\cos(\sqrt{x}) + C$

(d) $\dfrac{2x^{3/2}}{3} + \cos(x) + C$

(e) $\dfrac{2x^{3/2}}{3} - \cos(x) + C$

Name: ____________________________

Instructor: ________________________

**9.**(6 pts.) An underground beer pipeline in the city of Bruges has sprung a leak which is gradually worsening. Your statistics suggest that beer is leaking from the pipeline at a rate of $3t^2 - 4t + 3$ gallons per day, where $t$ denotes the number of days after the leak started. How many gallons of beer will have leaked in the first 2 days after the leak started?

(a) 5 gallons (b) 6 gallons (c) 8 gallons

(d) 7 gallons (e) 9 gallons

**10.**(6 pts.) Evaluate the following definite integral

$$\int_0^{\frac{\pi}{4}} \frac{\sin x}{\cos^3 x}\, dx$$

(a) $\frac{4}{\pi} - 1$ (b) $-\frac{1}{2}$ (c) $1 - \frac{4}{\pi}$ (d) $\frac{1}{2}$ (e) $\frac{1}{4}$

Name: ____________________________

Instructor: ________________________

**Partial Credit**

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

**11.**(13 pts.) (a) Evaluate the definite integral $\displaystyle\int_0^2 x^3\,dx$ using the right endpoint approximation and the **limit definition** of the definite integral.

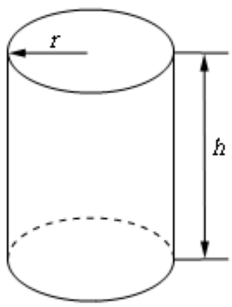
Hint: $1^3 + 2^3 + 3^3 + \cdots + n^3 = \left(\dfrac{n(n+1)}{2}\right)^2$.

(b) Verify your answer using the fundamental theorem of calculus.

Name: ______________________________

Instructor: __________________________

**12.**(13 pts.) A manufacturer needs to make a cylindrical can (top included ) that will hold 2000 $cm^3$ of liquid. Find the dimensions of the can (values of $r$ and $h$) that will minimize the amount of material used to make the can.
(Exact values such as $\sqrt{2}, \sqrt{3}, \pi, \sqrt{\pi}, etc$ ... should not be converted to a decimal approximation.)




**Note** that the surface area of a cylinder with no top or bottom is $2\pi rh$ $cm^2$.

$r =$ ________ $cm$ $\qquad$ $h =$ ________ $cm$.

Name: ______________________________

Instructor: __________________________

**13.**(12 pts.) Find the area of the bounded region between the curves

$$y = x^2 - 2x + 1 \quad \text{and} \quad y = 7 - x^2 + 2x.$$

Name: ____________________________

Instructor: ________________________

**14.**(2 pts.) You will earn 2 points if your instructor can read your name easily on the front page of the exam and you mark the answer boxes with an X (as opposed to a circle or any other mark).

**Rough Work**