Calculus 1 — Exam 5
MAT 250, Spring 2015 — D. Ivanšić

Name: _____

Show all your work!

Find the following antiderivatives.

1. (3pts) $\displaystyle\int \frac{1}{\sqrt[3]{x^2}}\,dx =$

2. (3pts) $\displaystyle\int \frac{5}{\sqrt{1-x^2}}\,dx =$

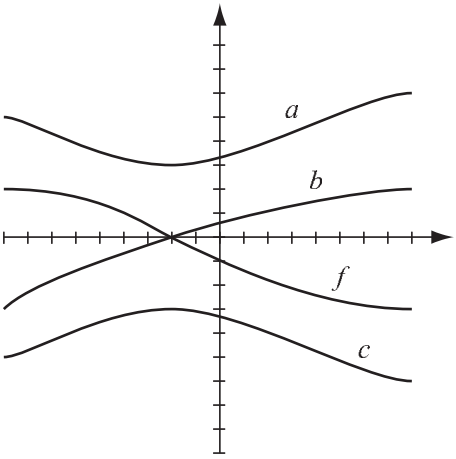
3. (3pts) $\displaystyle\int e^{3x+7}\,dx =$

4. (7pts) $\displaystyle\int \frac{u^2-u+1}{\sqrt{u}}\,du =$

5. (7pts) Find $f(x)$ if $f'(x) = \cos(3x) + \sec^2 x$ and $f(0) = 4$.

6. (8pts) Find $f(x)$ if $f''(x) = \dfrac{4}{x^3}$, $f'(1) = 3$ and $f(2) = -2$.

7. (6pts) The graph of a function f is shown. Which of the other graphs is an antiderivative of f and why?



8. (15pts) Find $\int_0^4 x - 1\, dx$ in two ways (they'd better give you the same answer!):
a) Using the "area" interpretation of the integral. Draw a picture and use area of triangles.
b) Using the Evaluation Theorem.

Use the substitution rule in the following integrals:

9. (8pts) $\int (3x^2 - 2x)\sqrt{x^3 - x^2 + 1}\, dx =$

10. (10pts) $\int_0^{\frac{\pi}{2}} \frac{\sin x}{2 + \cos x}\, dx =$

11. (10pts) $\int_3^5 \frac{e^{\frac{1}{x}}}{x^2}\, dx =$

12. (10pts) Evaluate the following integral by breaking it up into two integrals without absolute value and evaluating each one. The graph of $y = |x - 2|$ might help.

$\int_1^5 |x - 2|\, dx =$

13. (10pts) The rate at which water is flowing into a tank is $-t^2+10t-9$ liters per minute.
a) Use the Net Change Theorem to find by how much the volume of water in the tank has changed from $t=0$ to $t=6$.
b) If at time $t=0$ there were 23 liters of water in the tank, how many were there at time $t=6$?

Bonus. (10pts) A rocket takes off vertically from the ground, accelerating at constant acceleration. If at time $t=10$ seconds it is at height 900 meters, what was its acceleration?