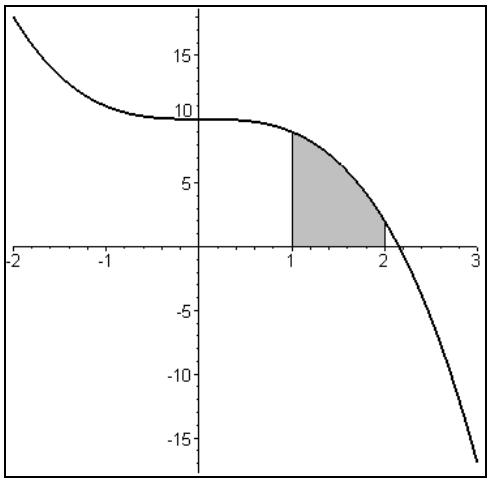
MTH 150 **Name: _____**
Exam 4
May 8, 2007

DIRECTIONS: Calculators are permitted on this part of the exam. However, answers based solely on calculator results are unacceptable. You must still <u>show all work</u> to receive full credit. Good luck.

1. The region whose area is given by the definite integral $\int_1^2 \left(10 - x^3\right) dx$ is shown below.



(a) **(6 points)** Approximate the area of the above region using left endpoints of 4 subintervals (rectangles) of equal width.

(b) **(4 points)** Use the Fundamental Theorem of Calculus to find the <u>exact</u> area.

2. Evaluate the definite integrals. Decimal approximations from the calculator earn **no credit**.

(a) **(5 points)** $\int_{-2}^{-1}\left(u-\frac{1}{u^2}\right)du$

(b) **(5 points)** $\int_{0}^{1}\frac{4}{1+x^2}dx$

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Exam 4
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DIRECTIONS: This is a <u>closed book</u>, <u>closed notes</u> exam. <u>No electronic devices</u> are allowed (this means calculators, computers, cell phones, pagers, etc.). Be neat and <u>show all work</u> to receive full credit. Correct answers without the supporting evidence to back it up (except where indicated) receive only partial credit. Good luck.

3. **(5 points)** Find an antiderivative of $f(x) = \frac{1}{x} + 5x^2$.

A. $\ln|x| + \frac{5}{3}x^3$
B. $-\frac{1}{x^2} + 10x$
C. $\ln|x| + 10x$
D. $-\frac{1}{x^2} + \frac{5}{3}x^3$
E. None of these

4. **(5 points)** Given that $\int_0^5 f(x)\,dx = 4$, find the value of $\int_{-2}^3 f(x+2)\,dx$.

A. 5
B. 4
C. 6
D. 8
E. 3

5. **(5 points)** Given a smooth, continuous function, which of the following statements is unconditionally true?

A. Differentiability $\Rightarrow$ Continuity $\Rightarrow$ Integrability
B. Integrability $\Rightarrow$ Continuity $\Rightarrow$ Differentiability
C. Continuity $\Rightarrow$ Integrability $\Rightarrow$ Differentiability
D. Differentiability $\Rightarrow$ Integrability $\Rightarrow$ Continuity
E. None of these

6. **(5 points)** Which of the following integrals can NOT be evaluated using the Basic Integration Rules?

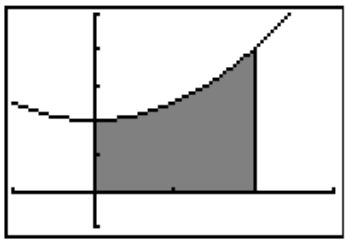
A. $\int 5^x dx$
B. $\int \sec x\,dx$
C. $\int \ln x\,dx$
D. $\int \sinh x\,dx$
E. $\int \sec^2 x\,dx$

7. **(5 points)** Given $\int_0^3 f(x)\,dx = 4$ and $\int_3^6 f(x)\,dx = -1$, evaluate $\int_0^6 \left[f(x) + 2 \right] dx$.

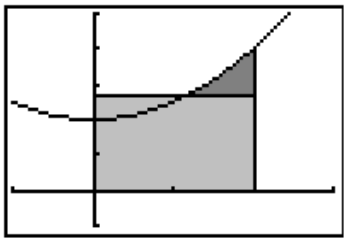
A. 3
B. 5
C. 6
D. 12
E. 15

8. **(5 points)** Which of the following is a graphical representation of the Mean Value Theorem for Integrals?

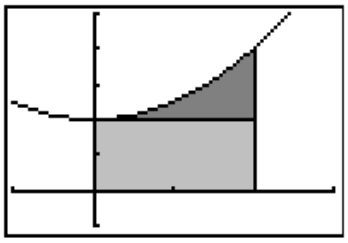
A.



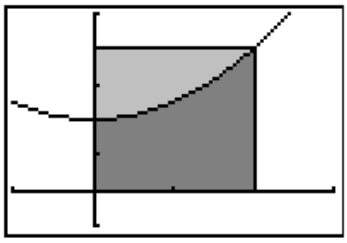
B.



C.



D.



9. **(5 points)** Find the particular solution of the differential equation $f'(x) = \sin x$ given that $f(\pi) = 2$.

A. $-\cos x + 1$
B. $\cos x + 3$
C. $-\cos x$
D. $\cos x + 2$
E. $-\cos x + 3$

10. **(5 points)** Find $F'(x)$ given that $F(x) = \int_1^{x^3} \sec t \; dt$.

A. $\sec\left(x^3\right)$
B. $\sec^2\left(x^3\right)$
C. $3x^2 \sec\left(x^3\right)$
D. $\sec^2\left(x^3\right)\tan\left(x^3\right)$
E. None of these

11. **(10 points)** $\int \sec(6x)\,dx$

12. **(10 points)** $\int x\sqrt{x+2}\;dx$

13. **(10 points)** $\int \frac{x+2}{\sqrt{4-x^2}}\,dx$

14. **(10 points)** $\int \frac{x^2-3x+2}{x+1}\,dx$

BONUS (Optional 10 points)

If f is a continuous function such that $\int_0^x f(t)\,dt = xe^{2x} + \int_0^x e^{-t} f(t)\,dt$ for all x, find an explicit formula for $f(x)$.