Math 16B, Section 3 - Winter 2018
Instructor: Christopher O'Neill
Practice Exam 2, Version 2

Last Name: _____ **First Name:** _____

Directions:

- The use of a calculator, cell phone, laptop or computer is prohibited.
- TURN OFF cell phones and put them away. If a cell phone is seen during the exam, your exam will be collected and you will receive a zero.
- Answer all of the questions, and present your solutions in the space provided. *Show all your work* neatly and concisely and *clearly indicate your final answer*. You will be graded not merely on the final answer, but on the quality and correctness of the work leading up to it.

The UC Davis Code of Academic Conduct

I will conduct myself with honesty, fairness, and integrity.

Signature: _____

(1) This problem concerns the following integral.

$$\int_1^{25} (3x^2 + 2)\ dx$$

Match each estimation method with an expression for the resulting estimate (there is only one correct expression for each method listed).

_____ Left hand sum with $n = 4$ rectangles

_____ Right hand sum with $n = 4$ rectangles

_____ Midpoint sum with $n = 4$ rectangles

(A) $(3(1)^2 + 2)(6) + (3(7)^2 + 2)(6) + (3(13)^2 + 2)(6) + (3(19)^2 + 2)(6) + (3(25)^2 + 2)(6)$

(B) $(3(1)^2 + 2)(4) + (3(7)^2 + 2)(4) + (3(13)^2 + 2)(4) + (3(19)^2 + 2)(4) + (3(25)^2 + 2)(4)$

(C) $(3(4)^2 + 2)(6) + (3(10)^2 + 2)(6) + (3(16)^2 + 2)(6) + (3(22)^2 + 2)(6)$

(D) $(3(7)^2 + 2)(6) + (3(13)^2 + 2)(6) + (3(19)^2 + 2)(6) + (3(25)^2 + 2)(6)$

(E) $(3(7)^2 + 2)(4) + (3(13)^2 + 2)(4) + (3(19)^2 + 2)(4) + (3(25)^2 + 2)(4)$

(F) $(3(1)^2 + 2)(6) + (3(7)^2 + 2)(6) + (3(13)^2 + 2)(6) + (3(19)^2 + 2)(6)$

(G) $(3(1)^2 + 2)(4) + (3(7)^2 + 2)(4) + (3(13)^2 + 2)(4) + (3(19)^2 + 2)(4)$

(H) $(3(1)^2 + 2)(4) + (3(7)^2 + 2)(4) + (3(19)^2 + 2)(4) + (3(25)^2 + 2)(4)$

(2) Evaluate each of the following integrals.

(a) $\int (24x^3 + 6x^2 + 5x + 7)\ dx$

(b) $\int (7e^x + 6\sin(x) - 5\cos(x))\ dx$

(c) $\int 60(5x + 2)^5\ dx$

(3) Evaluate each of the following integrals.

(a) $\int_0^2 (2x+3)\,dx$

(b) $\int_1^e \frac{5}{x}\,dx$

(4) Solve the following initial value problem.

$f''(x) = e^x \qquad f'(0) = 2 \qquad f(1) = e + 1.$

(5) Suppose a poorly built rocket is launched from ground level and has velocity (in ft/sec) given by

$$v(t) = 12 - 3t^2.$$

What is the maximum height that the rocket reaches?

(6) Evaluate the following integral *without* using the fundamental theorem of calculus.

$$\int_0^4 (3 - x)\, dx$$

Trigonometric Identities

$$\begin{aligned} 1 &= \sin^2(A) + \cos^2(A) \\ \sec^2(A) &= \tan^2(A) + 1 \\ \csc^2(A) &= 1 + \cot^2(A) \end{aligned}$$

$$\begin{aligned} \sin(A+B) &= \sin(A)\cos(B) + \cos(A)\sin(B) \\ \sin(A-B) &= \sin(A)\cos(B) - \cos(A)\sin(B) \\ \cos(A+B) &= \cos(A)\cos(B) - \sin(A)\sin(B) \\ \cos(A-B) &= \cos(A)\cos(B) + \sin(A)\sin(B) \end{aligned}$$

$$\begin{aligned} \sin(2A) &= 2\sin(A)\cos(A) \\ \cos(2A) &= \cos^2(A) - \sin^2(A) \end{aligned}$$

Error Estimates

$$|E_T| \leq \frac{M(b-a)^3}{12n^2} \qquad f''(x) \leq M \text{ for all } x \in [a,b]$$