

Math 16B: Short Calculus II
Winter 2018, Section 3
Homework Sheet 3
Due: Monday, February 5, 2018

Submit your solutions to the following problems in lecture on the due date above. Present your work in a clean and organized fashion, either on a printed copy of this document (preferred) or a separate sheet of paper. As stated in the syllabus, late submissions will **not** be accepted.

1. Evaluate the following indefinite integrals.

$$(a) \int (8x^3 - 6x + 1 + \frac{1}{x} + \sqrt{x}) dx = 2x^4 - 3x^2 + x + \ln|x| + \frac{2}{3}x^{3/2} + C$$

$$(b) \int (5e^{3x} + \sin(5x) + \cos(2x)) dx = \frac{5}{3}e^{3x} - \frac{1}{5}\cos(5x) + \frac{1}{2}\sin(2x) + C$$

check: $\frac{d}{dx} \left[\frac{5}{3}e^{3x} - \frac{1}{5}\cos(5x) + \frac{1}{2}\sin(2x) \right]$
 $= \frac{5}{3}e^{3x} \cdot 3 + \frac{1}{5}\sin(5x) \cdot 5 + \frac{1}{2}\cos(2x) \cdot 2$
 $= 5e^{3x} + \sin(5x) + \cos(2x) \checkmark$

2. Solve the following initial value problem.

$$f''(x) = 6x + 3, \quad f'(1) = 5, \quad f(0) = 3$$

$$f'(x) = 3x^2 + 3x + C$$

$$f'(1) = 5$$

$$5 = 3(1)^2 + 3(1) + C$$

$$C = -1$$

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

$$f(x) = x^3 + \frac{3}{2}x^2 - x + C$$

$$f(0) = 3$$

$$3 = (0)^3 + \frac{3}{2}(0)^2 - (0) + C$$

$$C = 3$$

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

3. Suppose the velocity of an accelerating car (in ft/sec) is given by the following equation.

$$v(t) = 3t^2 + 10t + 1$$

How far does the car travel in the first 10 seconds?

Position: $\int (3t^2 + 10t + 1) dt = t^3 + 5t^2 + t + C$

$$p(t) = t^3 + 5t^2 + t + C$$

$$\text{distance traveled} = p(10) - p(0) = (10^3 + 5(10)^2 + 10 + C) - (0^3 + 5(0)^2 + 0 + C)$$

$$= 1000 + 500 + 10 = \boxed{1510 \text{ ft}}$$