

MATH 190, Homework 5

Due date: Wednesday, Nov 28, 2018 (in class)

Hand in full solutions to the questions below. Make sure you justify all your work and include complete arguments and explanations. Your answers must be clear and neatly written, as well as legible (no tiny drawings or micro-handwriting please!). Your answers must be **stapled**, with your name and student number at the top of each page.

1. Compute the following integrals using any integration method.

(a) $\int \frac{4x + 3}{4x^2 + 6x - 1} dx$

(b) $\int 9x^2 \sin(2 + 6x^3) dx$

(c) $\int \cos(7x) dx$

(d) $\int (2 - x^2)e^{6x-x^3} dx$

(e) $\int x \cos(3x + \pi) dx$

(f) $\int x^2 \ln x dx$

(g) $\int e^x \cos x dx$

2. Compute the following definite integrals.

(a) $\int_{\pi/3}^0 \left(3 \sin\left(\frac{x}{2}\right) - 5 \cos(\pi - x) \right) dx$

(b) $\int_1^e \frac{\ln x}{x^2} dx$

(c) $\int_0^{2\pi} \sin x \ln(\cos x) dx$

3. An oil storage tank ruptures at time $t = 0$ and oil leaks from the tank at a rate of

$$r(t) = 100e^{0.01t}$$

litres per minute. How much oil leaks out during the first hour?

4. A ball is thrown upward with speed 2 m/s . Assume the acceleration due to gravity is constant. That is

$$a(t) = -g$$

in units of m/s^2 . Find the time when the ball turns around and starts to fall back down (i.e. the time when $v(t) = 0$).

5. You are driving on the highway with a velocity of 100 km/h . You see someone selling ice cream 100 m ahead and slam on the brakes. You accelerate at a constant (negative) rate of

$$a(t) = -50000\text{ km/h}^2$$

- . How long does it take before you stop? Do you stop in time?