

## HOMEWORK 9 - MATH 151

DUE DATE: Monday, April 19

INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. One part of each homework problem will be chosen at random and graded. Each question is worth 1 point. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Evaluate the following integrals:

- (a)  $\int \frac{\sin 3\theta}{1+\cos 3\theta} d\theta$
- (b)  $\int \frac{e^x}{1+e^x} dx$
- (c)  $\int \frac{dx}{x\sqrt{1-(\ln x)^2}}$
- (d)  $\int \frac{x}{\sqrt{4-5x^2}} dx$
- (e)  $\int x \cos(3x^2) dx$
- (f)  $\int e^{\sin x} \cos x dx$
- (g)  $\int x^3 e^{x^4} dx$
- (h)  $\int \frac{dy}{\sqrt{y} e^{\sqrt{y}}}$

2. Solve the initial value problems

- (a)  $\frac{dy}{dx} = 6 - 5 \sin 2x; \quad y(0) = 3$
- (b)  $\frac{dy}{dt} = \frac{1}{100+4t^2}; \quad y(-5) = \frac{3\pi}{80}$

3. Use Definition 6.4.3 with  $x_k^*$  as the right endpoint of each subinterval to find the area under the curve  $y = f(x)$  over the interval  $[a, b]$ :

- (a)  $y = 4 - \frac{1}{4}x^2; a = 0, b = 3$
- (b)  $y = 1 - x^3; a = -3, b = -1$

4. Use Theorem 6.5.4 and/or appropriate formulas from geometry to evaluate the integrals:

- (a)  $\int_0^3 (1 - \frac{1}{2}x) dx$
- (b)  $\int_0^\pi \cos x dx$
- (c)  $\int_0^2 \sqrt{4-x^2} dx$
- (d)  $\int -3^0 (2 + \sqrt{9-x^2}) dx$
- (e)  $\int_{-2}^2 (1 - 3|x|) dx$

5. Evaluate the following integrals using the Fundamental Theorem of Calculus:

- (a)  $\int_{-1}^2 x(1+x^3) dx$

- (b)  $\int_1^2 \frac{1}{x^6} dx$
- (c)  $\int_0^1 (x - \sec x \tan x) dx$
- (d)  $\int_{-1}^1 \frac{dx}{1+x^2}$
- (e)  $\int_{\pi/6}^{\pi/2} (x + \frac{2}{\sin^2 x}) dx$

6. Evaluate the integrals

- (a)  $\int_{-1}^2 \sqrt{2+|x|} dx$
- (b)  $\int_0^{\pi/2} |\frac{1}{2} - \sin x| dx$

7. Use substitution to evaluate the integrals:

- (a)  $\int_1^2 (4x-2)^3 dx$
- (b)  $\int_{-5}^0 x\sqrt{4-x} dx$
- (c)  $\int_0^{\pi/6} 2 \cos 3x dx$
- (d)  $\int_0^{\ln 5} e^x(3-4e^x) dx$
- (e)  $\int_{\ln 2}^{\ln(2/\sqrt{3})} \frac{e^{-x} dx}{\sqrt{1-e^{-2x}}}$

- 8. (a) Find the area under the curve  $y = 3 \cos 2x$  over the interval  $[0, \pi/8]$ .
- (b) Find the area under the curve  $y = \frac{1}{(3x+1)^2}$  over the interval  $[0, 1]$ .
- (c) Find the average value of  $f(x) = e^{-2x}$  over the interval  $[0, 4]$ .
- (d) Find the average value of  $f(x) = \frac{e^{3x}}{1+e^{6x}}$  over the interval  $[-\frac{\ln 3}{6}, 0]$ .