MATH 5A - Review Problems

(Chapter 4.9 & 5 & 6.1)

(1) Evaluate the following integrals.

(a) $\int \cos 2x\,dx$

(b) $\int x\sqrt{x}\,dx$

(c) $\int \sec x \tan x \, dx$

(d) $\int_1^3 5\,dx$

(2) Given velocity function $v(t) = t^2 - 4t$ (in meters per second) for a particle moving along a line, Find (a) the displacement and (b) the distance traveled over the time interval $[1,5]$

(3)A ball is thrown upward with a speed of 48 ft/sec from the edge of a cliff 432 ft above the ground.

(a) Find its height above the ground t seconds later.

(b) When does it reach its maximum height?

(4) Given the curve $y = x^3$ over the interval [1,2],

(a) Estimate the area under the graph of f(x) using 6 approximating rectangles and taking the sample points to be the midpoints.

(b) Find the exact value for the area under the curve using of Riemann sums definition of an integral with right endpoints as sample points. Show details carefully.

(c) Check your results in part (b) by computing the area using integration.

(5) Evaluate the following integrals. Give simplified, exact answers.

(a) $\int_0^{\pi/2} \sin x \cos^3 x \, dx$ (change to u's limits, required on this problem only)

(b) $\int_{-1}^{2} |x - 1|\,dx$

(c) $\int \sqrt{1 + x^2}\; x^5 dx$

(d) $\int_{-1}^{1/3} (1 - 3x)^{3/2}\,dx$

(e) $\int \frac{\cos\sqrt{x}}{\sqrt{x}}\,dx$

$\int (1 + \tan r)^3 \sec^2 r \, dr$

(f) $\int_{-1}^{1} 3x\sqrt{x^2 + 1}\,dx$

(g) $\int_{-3}^{3} \sqrt{9 - x^2}\,dx$

(h) $\int \frac{x}{\sqrt{1 - 3x^2}}\,dx$

(i) $\int_1^9 \frac{\sqrt{t} - 2t^2}{t}\,dt$

(j)

(6) Find the area of the region bounded above by the graphs of $y=x^2$ and $y=2-x$ and below by the x axis

two ways, by (a) integrating with respect to x and (b) integrating with respect to y. Sketch the region.

(7) Find the derivative of the function $g(x) = \int_0^{\cos x} \frac{1}{\sqrt{t+4}}\,dt$

Answers: (1) a) ½ sin2x + C b) $\frac{2}{5}x^{5/2}+C$ c) secx + c d) 10 (2) a) -20/3 b) 34/3 (3) s(t) = -16t²+48t+432, t=3/2 sec (4) (a) $\left(\frac{13}{12}\right)^3\cdot\frac{1}{6}+\left(\frac{15}{12}\right)^3\cdot\frac{1}{6}\left(\frac{17}{12}\right)^3\cdot\frac{1}{6}+\left(\frac{19}{12}\right)^3\cdot\frac{1}{6}+\left(\frac{21}{12}\right)^3\cdot\frac{1}{6}+\left(\frac{23}{12}\right)^3\cdot\frac{1}{6}$ (b) 15/4 (5) a) ¼ b) 5/2

c) $\frac{1}{7}\left(1+x^2\right)^{7/2}-\frac{2}{5}\left(1+x^2\right)^{5/2}+\frac{1}{3}\left(1+x^2\right)^{3/2}+C$ d) $\frac{64}{15}$ e) $2\sin\sqrt{x}+C$ f) 0 g) $\frac{9\pi}{2}$ h) $\frac{-1}{3}\left(1-3x^2\right)^{3/2}+C$ i) -76

j) $\frac{1}{4}(1+\tan r)^4+C$ (6) (a) $\int_0^1 x^2dx+\int_1^2(2-x)dx$ (b) $\int_0^1(2-y-\sqrt{y})dy=\frac{5}{6}$ (7) $\frac{-\sin x}{\sqrt{\cos x+4}}$