MATH 16B Sec. 5.4 AND 5.5 – EXTRA PROBLEMS

(I) FIND THE FOLLOWING DEFINITE INTEGRALS:

(1) $\displaystyle\int_0^3 x\sqrt{9-x^2}\,dx$

(2) $\displaystyle\int_e^{e^2} \frac{1}{x\ln x}\,dx$

(3) $\displaystyle\int_1^e \frac{60}{x(3\ln x+2)^2}\,dx$

(4) $\displaystyle\int_4^{36} \frac{5}{x+2\sqrt{x}}\,dx$

(5) $\displaystyle\int_0^{\pi/3} \frac{18\sec\theta\tan\theta}{(2\sec\theta-1)^3}\,d\theta$

(6) $\displaystyle\int_0^{\ln 3} \frac{36}{e^{2x}+9}\,dx$

(7) $\displaystyle\int_{-3}^{3} x^7\sqrt[3]{x^{10}+4}\,dx$

(8) $\displaystyle\int_{-1}^{3} |6x-3x^2|\,dx$

(9) $\displaystyle\int_{-\pi/8}^{\pi/8} \sin^5\frac{x}{3}\,dx$

(10) $\displaystyle\int_{-2}^{2} x^2\sqrt{64-x^6}\,dx$

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(II) (11) IF THE SPEED OF A BUG MOVING ALONG A LINE AFTER T MINUTES IS GIVEN BY $f(t)=\dfrac{60t}{(t^2+1)^2}$ FT/MIN, FIND ITS AVERAGE SPEED FOR THE FIRST 3 MINUTES.

(12) IF $P(t)=6.1e^{t/80}$ GIVES THE APPROXIMATE POPULATION OF THE WORLD (IN BILLIONS) T YEARS AFTER 2000, FIND THE AVERAGE POPULATION BETWEEN 2000 AND 2010.

(13) ASSUME THAT THE TOTAL COST OF PRINTING X COPIES OF A TEXTBOOK IS GIVEN BY $C(x)=30{,}000+20x$ (DOLLARS).

A) FIND THE AVERAGE COST PER UNIT IF 1,000 COPIES ARE PRINTED.

B) FIND THE AVERAGE VALUE OF THE COST FUNCTION ON $[0,1000]$.

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(III) FIND THE AREA OF THE REGION BOUNDED BY THE FOLLOWING CURVES:

(14) $y=\frac{1}{6}(x+4)$ AND $x=5-3y^2$

(15) $y=3x^2$, $y=\frac{24}{x}$, $x=1$, AND $x=4$

(16) $x=6-y^2$ AND $x=y^2-4y$

(17) $y=3\ln x$, $y=2\ln(x-5)$, $y=0$, AND $y=6$