Homework 2 1/23: MATH 112-1 Prof. Maxwell Auerbach

Show all work. No credit will be given for answers without sufficient work. No calculators are allowed. Collaboration with classmates is allowed, but all work submitted must be written out and explained by you.

1 Homework 2 Problems: Trigonometric Integrals

1.1 (7.2.1) Find $\int \sin^2(x)\cos^3(x)\,dx$

1.2 (7.2.21) Find $\int \tan(x)\sec^3(x)\,dx$

1.3 (7.2.2) Find $\int \sin^3(\theta)\cos^4(\theta)\,d\theta$

1.4 (7.2.10) Find $\int_0^{\pi} \sin^2(x)\cos^4(x)\,dx$

1.5 (7.2.26) Find $\int_0^{\pi/4} \tan^6(x)\sec^6(x)\,dx$

1.6 (7.2.65) A particle moves on a straight line with velocity function $v(t) = \sin(\omega t)\cos^2(\omega t)$. Find its position function $s = f(t)$ if $f(0) = 0$.

Extra Problems 1/23: MATH 112-1 Prof. Maxwell Auerbach

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2 Extra Problems: Trigonometric Integrals

2.1 Find the following integrals.

2.1 a) (7.2.17) $\int \sin^2(x)\sin(2x)\,dx$

2.1 b) (7.2.11) $\int_0^{\pi/2} \sin^2(x)\cos^2(x)\,dx$

2.1 c) (original) $\int \cot^3(t)\sin^5(t)\,dt$

2.1 d) (7.2.19) $\int t\sin^2(t)\,dt$

2.1 e) (original) $\int \sin^5(x)\cos^4(x)\,dx$

2.1 f) (7.2.25) $\int \tan^4(x)\sec^6(x)\,dx$

2.1 g) (7.2.32) $\int \tan^2(x)\sec(x)\,dx$

2.1 h) (original) $\int \sin^4(t)\sec^8(t)\,dt$

2.1 i) (7.2.42) $\int_0^{\pi/2} \sin(2\theta)\sin(6\theta)\,d\theta$

2.1 j) (original) $\int \tan^2(t)\cos^5(t)\,dt$

2.2 (original) Apanii and Boutros are racing toy cars. Apanii finds her car travels at a speed of $a(t) = (2-\sin(t))^2$ meters per second, and Boutros finds his car travels at a speed of $b(t) = \cos(5t)\cos(10t)+1$ meters per second. Both of their cars start at time $t = 0$ and miraculously stop at time $t = \pi/2$ and move no further. Whose car went farthest?

2.3 (original) A company finds that for a wire they are producing the cost is determined by the function $f(x) = 5x\sec^2(x)\tan^5(x)$ dollars per centimeter. If they make the wire at a length of $\pi/4$ centimeters, how much will the wire cost?

2.4 (7.2.67) Show that if M and N are positive integers then $\int_{-\pi}^{\pi} \sin(Mx)\cos(Nx)\,dx = 0$.