Evaluate $\int (x^3 - 2x^2 - 3)e^{-\frac{x}{2}}\, dx$.

SCORE: _____ / 5 PTS

u		dv
x^3-2x^2-3	$+$	$e^{-\frac{x}{2}}$
$3x^2-4x$	$-$	$-2e^{-\frac{x}{2}}$
$6x-4$	$+$	$4e^{-\frac{x}{2}}$
6	$-$	$-8e^{-\frac{x}{2}}$
0		$16e^{-\frac{x}{2}}$

$$= -2(x^3-2x^2-3)e^{-\frac{x}{2}}$$
$$-4(3x^2-4x)e^{-\frac{x}{2}}$$
$$-8(6x-4)e^{-\frac{x}{2}}$$
$$-96e^{-\frac{x}{2}}$$

1 POINT EACH

$$= (-2x^3-8x^2-32x-58)e^{-\frac{x}{2}} + C$$

$-\frac{1}{2}$ IF YOU FORGOT

Evaluate $\int \frac{(\ln x)^2}{\sqrt{x}}\,dx$. $= \underbrace{2\sqrt{x}(\ln x)^2}_{1\frac{1}{2}} \underbrace{- 8\sqrt{x}\ln x}_{2} \underbrace{+ 16\sqrt{x}}_{1\frac{1}{2}} + C$

SCORE: _____ / 5 PTS

$-\frac{1}{2}$ IF YOU FORGOT

	u		dv	
	$(\ln x)^2$	$+$	$x^{-\frac{1}{2}}$	
	$\frac{2\ln x}{x}$		$2x^{\frac{1}{2}}$	
$\times$				$\frac{1}{x}$
	$2\ln x$	$-$	$2x^{-\frac{1}{2}}$	
	$\frac{2}{x}$		$4x^{\frac{1}{2}}$	
$\times$				$\frac{1}{x}$
	2	$+$	$4x^{-\frac{1}{2}}$	
	0		$8x^{\frac{1}{2}}$	

Evaluate $\int \tan^4 x \sec^4 x \, dx$. $= \int \tan^4 x \sec^2 x \cdot \sec^2 x \, dx$

SCORE: _____ / 5 PTS

1 $\underline{u = \tan x}$

$du = \sec^2 x \, dx$

$= \underline{\int u^4 (u^2 + 1) \, du}$ 2

$= \int (u^6 + u^4) \, du$

$= \underline{\frac{1}{7} u^7 + \frac{1}{5} u^5} + C$
1

$= \underline{\frac{1}{7} \tan^7 x + \frac{1}{5} \tan^5 x} + C$
1

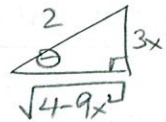
$-\frac{1}{2}$ IF YOU FORGOT

☆ TALK TO ME IF YOU WROTE IN TERMS OF SEC X AND USED REDUCTION FORMULA

Evaluate $\int x^2\sqrt{4-9x^2}\,dx$. **SCORE: _____ / 9 PTS**

$x = \frac{2}{3}\sin\theta \longrightarrow \sin\theta = \frac{3x}{2}$

$dx = \frac{2}{3}\cos\theta\,d\theta$



$\frac{1}{2}$

$\int \frac{4}{9}\sin^2\theta \cdot 2\cos\theta \cdot \frac{2}{3}\cos\theta\,d\theta$

1 POINT EACH UNLESS OTHERWISE MARKED

$= \frac{16}{27}\int \sin^2\theta\cos^2\theta\,d\theta$ $\frac{1}{2}$

$= \frac{16}{27}\int (1-\cos^2\theta)\cos^2\theta\,d\theta$

$= \frac{16}{27}\left[\int\cos^2\theta\,d\theta - \int\cos^4\theta\,d\theta\right]$

☆ TALK TO ME IF YOU WROTE IN TERMS OF $\sin x$

$= \frac{16}{27}\left[\int\cos^2\theta\,d\theta - \frac{1}{4}\cos^3\theta\sin\theta - \frac{3}{4}\int\cos^2\theta\,d\theta\right]$

$= \frac{16}{27}\left[-\frac{1}{4}\cos^3\theta\sin\theta + \frac{1}{4}\left(\frac{1}{2}\cos\theta\sin\theta + \frac{1}{2}\theta\right)\right] + C$

$= -\frac{4}{27}\left(\frac{\sqrt{4-9x^2}}{2}\right)^3\frac{3x}{2} + \frac{2}{27}\frac{\sqrt{4-9x^2}}{2}\frac{3x}{2} + \frac{2}{27}\sin^{-1}\frac{3x}{2} + C$

$= -\frac{1}{36}x\sqrt{4-9x^2}^{\,3} + \frac{1}{18}x\sqrt{4-9x^2} + \frac{2}{27}\sin^{-1}\frac{3x}{2} + C \leftarrow -\frac{1}{2}$ IF YOU FORGOT

Prove the reduction formula $\int \sec^n u \, du = \frac{1}{n-1} \sec^{n-2} u \tan u + \frac{n-2}{n-1} \int \sec^{n-2} u \, du$ (where $n \neq 1$). SCORE: _____ / 6 PTS

NOTE: You must show how to get this formula.
You will receive 0 credit if your "proof" is differentiating both sides of the equation.

u	dv
$\sec^{n-2} u$	$\sec^2 u$
$(n-2)\sec^{n-2} u \tan u$	$\tan u$

$+$ $-$

$1\frac{1}{2}$ $1\frac{1}{2}$

$$\int \sec^n u \, du = \underbrace{\sec^{n-2} u \tan u}\ \underbrace{- (n-2) \int \sec^{n-2} u \tan^2 u \, du}$$

$$\int \sec^n u \, du = \sec^{n-2} u \tan u - (n-2) \underbrace{\int \sec^{n-2} u (\sec^2 u - 1) \, du}$$ 1

$$\int \sec^n u \, du = \sec^{n-2} u \tan u - (n-2) \int \sec^n u \, du + (n-2) \int \sec^{n-2} u \, du$$

$$\underbrace{(n-1) \int \sec^n u \, du = \sec^{n-2} u \tan u + (n-2) \int \sec^{n-2} u \, du}$$ 1

$$\underbrace{\int \sec^n u \, du = \frac{1}{n-1} \sec^{n-2} u \tan u + \frac{n-2}{n-1} \int \sec^{n-2} u \, du}$$ 1