Math 1152, Quiz #2, Spring 2014 Name KEY

Instructions: Show all work. Use *exact* answers unless specifically asked to round. You may check your answers in the calculator, but you must show work to receive credit.

1. Find the length of the arc along the curve $f(x) = \frac{1}{8}x^4 + \frac{1}{4}x^{-2}$ on the interval [1,2].

$f'(x) = \frac{1}{2}x^3 - \frac{1}{2}x^{-3}$ $\quad \left(\frac{1}{2}x^3 - \frac{1}{2}x^{-3}\right)^2 = \frac{1}{4}x^6 - 1/2 + \frac{1}{2}x^{-6}$

$1 + (f'(x))^2 = \frac{1}{4}x^6 + \frac{1}{2} + \frac{1}{2}x^{-6} =$
$\left(\frac{1}{2}x^3 + \frac{1}{2}x^{-3}\right)^2$

$$\int_1^2 \sqrt{\left(\tfrac{1}{2}x^3 + \tfrac{1}{2}x^{-3}\right)^2}\,dx = \int_1^2 \tfrac{1}{2}x^3 + \tfrac{1}{2}x^{-3}\,dx = \tfrac{1}{8}x^4 - \tfrac{1}{4}x^{-2}\Big|_1^2$$

$$\left[\tfrac{1}{8}(16) - \tfrac{1}{4}\left(\tfrac{1}{4}\right)\right] - \left[\tfrac{1}{8}(1) - \tfrac{1}{4}\left(\tfrac{1}{1^2}\right)\right] = 2 - \tfrac{1}{16} - \tfrac{1}{8} + \tfrac{1}{4} = 33/16$$

2. Integrate.
   a. $\int x^2 e^x dx$

+/-	u	dv
+	x^2	e^x
−	$2x$	e^x
+	2	e^x
−	0	e^x

$= x^2e^x - 2xe^x + 2e^x + C$

   b. $\int sin^4x\, cos^3x\, dx$

$= \int \sin^4x\,(1 - \sin^2x)\cos x\,dx \Rightarrow$ $u = \sin x$, $du = \cos x\,dx$

$\int u^4(1-u^2)\,du = \int u^4 - u^6\,du =$

$\frac{1}{5}\sin^5x - \frac{1}{7}\sin^7x + C$