Your Name: Key

Calculus I, Math 151-06, Quiz #11

1. **[6 points]** Suppose a particle moves on a straight line in such a way that its velocity is 6 ft/s for its first two seconds of travel, and then -4 ft/s after that. Find the total distance travelled by the particle on the interval $1 \leq t \leq 4$.

$$\text{Dist travelled} = \int_1^4 |v(t)|\,dt = \int_1^2 |6|\,dt + \int_2^4 |-4|\,dt$$

$$= \int_1^2 6\,dt + \int_2^4 4\,dt$$

$$= 6(2-1) + 4(4-2) = 6 + 8 = \boxed{14 \text{ ft}}$$

2. **[19 points total]** Evaluate the following integrals.

   (a) **[6 points]** $\displaystyle\int 2\sec^2 t\,(3 - 4\tan t + 2\tan^2 t)\,dt$

$u = \tan t$

$du = \sec^2 t\,dt$

$$= \int 2(3 - 4u + 2u^2)\,du$$

$$= \int (6 - 8u + 4u^2)\,du = 6u - 4u^2 + \frac{4}{3}u^3 + C$$

$$= \boxed{6\tan t - 4\tan^2 t + \frac{4}{3}\tan^3 t + C}$$

(b) **[6 points]** $\int \frac{e^{\sqrt{w}}}{\sqrt{w}}\,dw$

$u = \sqrt{w}$

$du = \frac{1}{2\sqrt{w}}\,dw$

$2\,du = \frac{1}{\sqrt{w}}\,dw$

$= \int 2e^u\,du = 2e^u + C = \boxed{2e^{\sqrt{w}} + C}$

(c) **[7 points]** $\int_0^{\ln 2} \frac{e^z}{e^z+1}\,dz$

$u = e^z + 1$

$du = e^z\,dz$

$z = 0$: $u = e^0 + 1 = 1 + 1 = 2$

$z = \ln 2$: $u = e^{\ln 2} + 1 = 2 + 1 = 3$

$= \int_2^3 \frac{du}{u} = \ln|u|\Big]_2^3 = \boxed{\ln 3 - \ln 2}$

(or $\boxed{\ln \frac{3}{2}}$)