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MATH 238 **QUIZ#4 (CH.13)** **SPRING 2014** **NAME:** Mai Phung

1. $(5\,pts)$ Find the particular solution for the differential equation $\frac{dy}{dx}=\frac{2}{1+x}$; $y(0)=5$

$$dy = \int \frac{2}{1+x}dx = 2\int \frac{1}{1+x}dx \qquad u = 1+x,\ du = dx$$

$$= 2\int \frac{1}{u}du = 2\ln|u| + C = 2\ln|1+x| + C$$

$$y(0) = 2\ln(1) + C = 5 \rightarrow C = 5$$

$$\boxed{y = 2\ln|1+x| + 5}$$ ✓

2. $(5\,pts)$ Find the indefinite integral $\int\left(3\sqrt{x}+\frac{2}{\sqrt{x}}\right)dx = 3\int x^{1/2}dx + 2\int x^{-1/2}dx$

$$y = 3\,\frac{x^{3/2}}{\frac{3}{2}} + 2\,\frac{x^{1/2}}{\frac{1}{2}} + C$$

$$y = \boxed{2x^{\frac{3}{2}} + 4\sqrt{x} + C}$$ ✓

3. $(5\,pts)$ Find the indefinite integral $\int\frac{x^3}{\sqrt{2x^4+3}}dx$

let $u = 2x^4 + 3$

$du = 8x^3dx$

$$\int \frac{x^3}{\sqrt{2x^4+3}}dx = \frac{1}{8}\int \frac{1}{u^{1/2}}du = \frac{1}{8}\,\frac{u^{1/2}}{\frac{1}{2}} + C$$

$$= \boxed{\frac{1}{4}\sqrt{2x^4+3} + C}$$ ✓

4. $(10\,pts)$ Evaluate the integrals:

a) $\int_2^3 12\left(x^2-4\right)^5 x\,dx$

$u = x^2 - 4$

$du = 2x\,dx$

$\frac{1}{6}\cdot 2$

$= 6\int_2^3 2x\,(x^2-4)^5\,dx = 6\int_0^5 u^5\,du = 6\cdot\frac{u^6}{6}\Big|_0^5 = u^6\Big|_0^5$

$= 5^6 - 0^6 = 15{,}625$

✓

b) $\int_1^e \frac{\ln t}{t}\,dt$

$u = \ln t$

$du = \frac{1}{t}\,dt$

$= \int_0^1 u\,du = \frac{u^2}{2}\Big|_0^1 = \frac{1}{2}$

✓