Math242 — **Quiz 0** — 11 January 2011

Name: Solution

Directions: Show all work. No credit for answers without work.

1. [**3 parts, 2 points each**] Let A, B, C, and k be constants. In the following, $\arcsin(x)$ is the inverse of $\sin(x)$, so that $\arcsin(\sin(x)) = x$ and similarly, $\arctan(x)$ is the inverse of $\tan(x)$. Differentiate the following with respect to x.

   (a) $y = (Ax^2 + Bx + C)^5$

$$y' = 5(Ax^2+Bx+C)^4 \cdot \frac{d}{dx}\left[Ax^2+Bx+C\right]$$

$$= \boxed{5(Ax^2+Bx+C)\cdot(2Ax+B)}$$

   (b) $y = \tan(Ax) + e^{Bx} + x^{2k}$

$$y' = \boxed{\sec^2(Ax)\cdot A + Be^{Bx} + (2k)\,x^{2k-1}}$$

   (c) $y = \arcsin(kx) + \arctan(kx)$

$$y' = \frac{1}{\sqrt{1-(kx)^2}}\cdot k + \frac{1}{1+(kx)^2}\cdot k$$

$$= \boxed{\frac{k}{\sqrt{1-(kx)^2}} + \frac{k}{1+(kx)^2}}$$

2. [**2 parts, 2 points each**] Solve the following integrals.

(a) $\int x^2 + x(5x^2+12)^8\,dx$

$$= \int x^2 dx + \frac{1}{10}\int (5x^2+12)^8 \cdot 10x\,dx$$

$u = 5x^2+12$

$du = 10x\,dx$

$$= \frac{x^3}{3} + \frac{1}{10}\int u^8\,du$$

$$= \frac{x^3}{3} + \frac{1}{10}\frac{u^9}{9} + C$$

$$= \boxed{\frac{x^3}{3} + \frac{1}{90}(5x^2+12)^9 + C}$$

(b) $\int \sin(x)\cos(x)\,dx$

$u = \sin(x)$

$du = \cos(x)dx$

$$\int \sin(x)\cos(x)\,dx$$

$$= \int u\,du$$

$$= \frac{u^2}{2} + C$$

$$= \boxed{\frac{\sin^2(x)}{2} + C}$$