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**Math 126: Calc III**  
**Derivative & Integral Review**

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1. Basic derivatives: find  $\frac{dy}{dx}$ :

(a)  $y = x^{12}$       (b)  $y = \pi x^e$       (c)  $y = \sqrt[3]{2x^5}$       (d)  $y = \sin^{-1}(3x)$

(e)  $y = 2^x + 2x$     (f)  $y = \cos^3(x)$     (g)  $y = 4x \ln(x)$     (h)  $y = \sec(x + \sec(x))$

2. A few trickier ones:

(a)  $y = (\arcsin(x))^x$     (b)  $y = \frac{\sqrt{x} + \sin(x)}{e^x + 1}$     (c)  $y = a \cdot b^{cx}$     (d)  $y = (2t + zx)^2$

3. Basic integrals:

(a)  $\int (12x^5 + 4x) dx$     (b)  $\int e^x dx$       (c)  $\int \cos(5x) dx$

(d)  $\int \left(\frac{1}{x} + \frac{1}{x^2}\right) dx$     (e)  $\int \frac{9}{1+x^2} dx$     (f)  $\int 5 \sec(x) \tan(x) dx$

4. Trickier integrals:

(a)  $\int x \sin(x^2) dx$

(b)  $\int \sec^2(x) \tan^2(x) dx$

(c)  $\int \frac{\ln(x)}{x} dx$

(d)  $\int x \sin(x) dx$

(e)  $\int x^3 \ln(x) dx$

(f)  $\int \sin(x)e^x dx$

(g)  $\int \sin^4(x) dx$

(h)  $\int \frac{5x - 4}{x^2 - x - 2} dx$

(i)  $\int \frac{x^3 - x^2 - 22x + 41}{x + 5} dx$

(j)  $\int \frac{1}{x^2 \sqrt{x^2 - 1}} dx$

(k)  $\int e^{\sqrt{x}} dx$