Find the derivatives of the following. Each requires the chain rule:

1. $f(x) = \tan(x^3)$
2. $f(x) = \sqrt{1 - x^2}$
3. $f(x) = \sin^{-1}(x^2)$
4. $f(x) = \log(\sin(x))$
5. $f(x) = e^{x^2}$
6. $f(x) = e^{\sin(x)}$
7. $f(x) = \tan^{-1}(2x)$
8. $f(x) = \log^2(x)$

Using the answers above, modified if necessary, find the following anti derivatives:

1. $\int \frac{\log(x)}{x} dx$
2. $\int \frac{1}{1+4x^2} dx$
3. $\int \cos(x) e^{\sin(x)} dx$
4. $\int x e^{x^2} dx$
5. $\int \cot(x) dx$
6. $\int \frac{x}{\sqrt{1-x^4}} dx$
7. $\int \frac{x}{\sqrt{1-x^2}} dx$
8. $\int x^2 \sec^2(x^3) dx$

Find the following derivatives. Each requires the product rule:

1. $f(x) = x \log(x) - x$
2. $f(x) = \sin(x) - x \cos(x)$
3. $f(x) = 6x^6 \log(x) - x^6$
4. $f(x) = x \left(\log^2(x) - 2 \log(x) + 2\right)$
5. $f(x) = \sqrt{x} \sin(\sqrt{x}) + \cos(\sqrt{x})$
6. $f(x) = e^x(\sin(x) - \cos(x))$

Using the above answers, find the following anti derivatives

1. $\int e^x \sin(x) dx$
2. $\int \cos(\sqrt{x}) dx$
3. $\int \log^2(x) dx$
4. $\int x^5 \log(x) dx$
5. $\int x \sin(x) dx$
6. $\int \log(x) dx$