Problem Set 3.7

1. Find $y' = \frac{dy}{dx} = D_x(y)$ by implicit differentiation.

(1) $xy + 2x + 3y^2 = 4$

(2) $\sin(xy) = y^2$

2. (1) Find y' and y'' at $(1,1)$ if $x^2 + xy + y^2 = 3$.

(2) Find the equation of the tangent line to the curve $x^2 + xy + y^2 = 3$ at $(1,1)$.

Problem Set 3.10

Derivatives

$D_x(\sin^{-1}x) = \frac{1}{\sqrt{1-x^2}}$	$D_x(\tan^{-1}x) = \frac{1}{1+x^2}$
$D_x(\sinh x) = \cosh x$	$D_x(\cosh x) = \sinh x$

3. Find the derivative of the function.

(1) $y = \sin^{-1}(2x+1)$

(2) $y = \ln(\tan^{-1}x)$

(3) $y = \sinh x \cosh 3x$

Problem Set 3.11

Let $y = f(x)$ and x change from a to $a + \triangle x$.
actual change : $\triangle y = f(a+\triangle x) - f(a)$
differential : $dy = f'(a)dx = f'(a)\triangle x$

4. Find $\triangle y$ and dy where $y = 2x - x^2$, $x = 2$, $\triangle x = dx = -0.3$.

At $x = a$,
linear approximation : $L(x) = f(a) + f'(a)(x-a)$

5. Find the linear approximation to the function $f(x) = \sin x$ at $x = \frac{\pi}{6}$.

Approximation $f(a+\triangle x)$ where $\triangle x = dx$ using;
a differential : $f(a+\triangle x) \approx f(a) + f'(a)dx$
a linear approximation : $f(a+\triangle x) \approx L(a+\triangle x)$

6. Approximate $\sqrt{99.8}$.

(1) Find $f(x)$ and a point a near 99.8 to approximate $\sqrt{99.8}$.

$f(x) =$

$a =$

(2-1) [method1] Use a differential to approximate $\sqrt{99.8}$.

(2-2) [method2] Use a linear approximation to approximate $\sqrt{99.8}$.