Calculus BC 3-2 Pg 170 #1-14 odd, 31 (Day 1)

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

$$y' = \frac{-2x}{\sqrt{1-x^4}}$$

(3) $y = \sin^{-1}\sqrt{2}\cdot t$

$$y' = \frac{\sqrt{2}}{\sqrt{1-2t^2}}$$

(5) $y = \sin^{-1}\left(\frac{3}{t^2}\right)$

$$y' = \frac{-6t^{-3}}{\sqrt{1-\frac{9}{t^4}}}$$

$$= \frac{-6}{t^3\sqrt{\frac{t^4-9}{t^4}}}$$

$$= \frac{-6}{t\sqrt{t^4-9}}$$

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

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

$$= \sin^{-1}x$$

(9) $x(t) = \sin^{-1}\left(\frac{t}{4}\right)$

$$v(t) = \frac{1}{4}\cdot\frac{1}{\sqrt{1-\frac{t^2}{16}}}$$

$$v(3) = \frac{1}{4}\cdot\frac{1}{\sqrt{\frac{7}{16}}} = \frac{1}{4}\cdot\frac{1}{\frac{\sqrt{7}}{4}} = \frac{1}{\sqrt{7}}$$

(11) $x(t) = \tan^{-1}t$

$$v(t) = \frac{1}{1+t^2}$$

$$v(2) = \frac{1}{1+4} = \frac{1}{5}$$

(13) $y = \sec^{-1}(2s+1)$

$$\frac{dy}{ds} = \frac{2}{|2s+1|\sqrt{4s^2+4s+1-1}}$$

$$= \frac{1}{|2s+1|\sqrt{s^2+s}}$$

$\Rightarrow$

(15) $y = \csc^{-1}(x^2+1)$, $x > 0$

$$\frac{dy}{dx} = \frac{-2x}{(x^2+1)\sqrt{x^4+2x^2+1-1}}$$

$$= \frac{-2}{(x^2+1)\sqrt{x^2+2}}$$

(17) $y = \sec^{-1}\frac{1}{t}$, $0 < t < 1$

$$\frac{dy}{dt} = \frac{-\frac{1}{t^2}}{\frac{1}{t}\sqrt{\frac{1}{t^2}-1}}$$

$$= \frac{-1}{t\sqrt{\frac{1-t^2}{t^2}}}$$

$$= \frac{-1}{\sqrt{1-t^2}}$$

(19) $y = \cot^{-1}\sqrt{t-1}$

$$\frac{dy}{dt} = \frac{-\frac{1}{2\sqrt{t-1}}}{1+t-1}$$

$$= \frac{-1}{2t\sqrt{t-1}}$$

(31) $x(t) = \tan^{-1} t$, $t \geq 0$

a) $v(t) = \frac{1}{1+t^2}$ since $v(t) > 0$ $\forall\, t \geq 0$, Partical always moving right.

b) $a(t) = \frac{-2t}{(1+t^2)^2}$ which is always negative

c) $\lim_{x\to\infty} \tan^{-1} t = \frac{\pi}{2}$

Calculus BC §3-8 Pg 170 # 28, 34, 37-40

(Dec 12)

(28) $f(x) = x^5 + 2x^3 + x - 1$

$f'(x) = 5x^4 + 6x^2 + 1$

a) $f(1) = 3$

$f'(1) = 12$

b) $f^{-1}(3) = 1$, $\left.\frac{df^{-1}}{dx}\right|_{x=3} = \frac{1}{\left.\frac{df}{dx}\right|_{x=1}} = \frac{1}{12}$

(34) $f(x) = \cos x + 3x$

a) $f'(x) = -\sin x + 3$

b) $f(0) = 1$ $f'(0) = 3$

c) $f^{-1}(1) = 0$ $\left.\frac{df^{-1}}{dx}\right|_{x=1} = \frac{1}{\left.\frac{df}{dx}\right|_{x=0}} = \frac{1}{3}$

(37) $\frac{d}{dx}\left(\sin^{-1}\frac{x}{2}\right)$

$= \frac{\frac{1}{2}}{\sqrt{1 - \frac{x^2}{4}}}$

$= \frac{1}{2\sqrt{\frac{4-x^2}{4}}}$

$= \frac{1}{\sqrt{4-x^2}}$

E

(38) $\frac{d}{dx}(\tan^{-1} 3x)$

$= \frac{3}{1+9x^2}$

D

(39) $\frac{d}{dx}(\sec^{-1} x^2)$

$= \frac{2x}{x^2\sqrt{x^4-1}} = \frac{2}{x\sqrt{x^2-1}}$

A

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

$\frac{dy}{dx} = \frac{2}{1+4x^2}$

$\left.\frac{dy}{dx}\right|_{x=1} = \frac{2}{5}$

C