3.3 p 124

(2) x^2-1

(4) $2x+1$

(6) $-1+2x-3x^2$

(8) at $x=\frac{4\pm\sqrt{13}}{3}$ or $x\approx 0.131, 2.535$

(10) at $x=0,1$

(12) at $x=\frac{21\pm\sqrt{377}}{8}$ or $x\approx 0.198, 5.052$

(14) $\frac{x^2-3}{x^2}$ or $1-\frac{3}{x^2}$

(16) $5x^4+3x^2+2x$

(18) $\frac{-5}{x^2}+\frac{2}{x^3}$

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

~~14~~, ~~18~~, ~~16~~, 20 (graph)

~~8~~, ~~12~~, ~~19~~,

$Y1=\frac{d}{dx}(f(x))\Big|_{x=x}$

$Y2=\frac{x^2-2x-1}{(1+x^2)^2}$

(16) $(x^2+1)(x^3+1)$

$x^5+x^3+x^2+1$

$y=5x^4+3x^2+2x$

More 3.3 - Derivative Rules

Ex) f and g are differentiable at $x=0$.

$f(2)=3,\ f'(2)=-4,\ g(2)=1,\ g'(2)=2.$

① $\frac{d}{dx}(fg) = f\cdot g' + g\cdot f'$

$= 3\cdot 2 + 1\cdot -4$

$= 6 + -4 = 2$

TRY:

② $\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{g\cdot f' - f\cdot g'}{g^2} = \frac{1\cdot -4 - 3\cdot 2}{1} = -10$

Ex) 200 trees yielding 15 bushels/tree

Expanding at 15 trees/year

The yield for each tree is increasing at 1.2 bushels/tree each year.

Current rate of change of production for total crop?

$T(x) = (\text{bushels per tree})(\#\text{ of trees})$

Now $200\cdot 15$

$T(x) = b(x)\cdot n(x)$

$= b(x)\cdot n'(x) + n(x)\cdot b'(x)$

$= 15\cdot 15 + 200\cdot 1.2$

$= 225 + 240$

$= 465$ bushels per year

3.4 - Velocity and other rates of change

Notation

$$y' = \frac{dy}{dx}$$

$$y'' = \frac{d}{dx}\left(\frac{dy}{dx}\right) = \frac{d^2y}{dx^2}$$

$$y''' = \frac{d}{dx}\left(\frac{d^2y}{dx^2}\right) = \frac{d^3y}{dx^3}$$

Motion Along a Line

Position: $s = f(t)$

Displacement of a particle: Δs

from t to $t+\Delta t = s(t+\Delta t) - s(t)$

Average velocity: $\frac{\Delta s}{\Delta t} = \frac{f(t+\Delta t) - f(t)}{\Delta t}$

Instantaneous velocity: $v(t) = \lim_{\Delta t \to 0} \frac{f(t+\Delta t) - f(t)}{\Delta t} = s'(t)$

Speed: always +

HW: p124 # 23, 25, 38-41, 46, 47, 51, 52