Chapter 2

Derivative
อนุพันธ์ของฟังก์ชัน

2.1 Definition of Derivative
นิยามพื้นฐานของอนุพันธ์

ข้อ 14 -2

ข้อ 15 $2x$

ข้อ 16 2

ข้อ 17 2

ข้อ 18

18.1 0

18.2 Yes, because $\lim_{\Delta x \to 0} \dfrac{f(1+\Delta x) - f(1)}{\Delta x}$ exists.

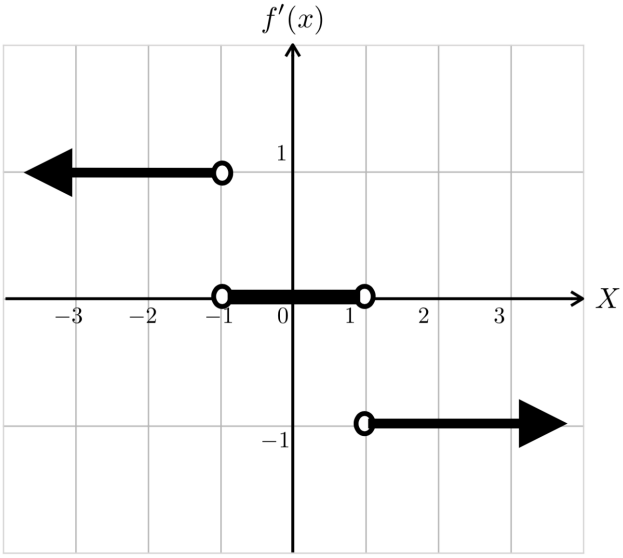
18.3 $y = \dfrac{4}{3}x - \dfrac{5}{3}$

ข้อ 19 $y = 6x - 1$

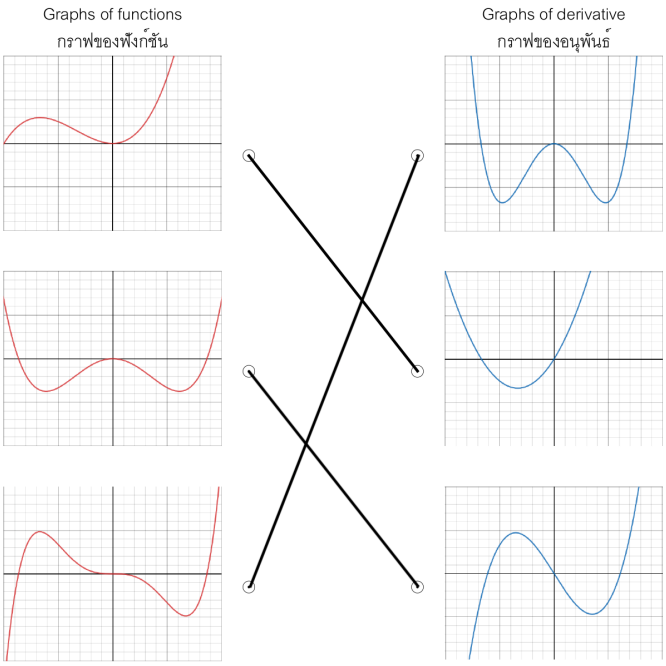
ข้อ 20 $y = -2x + 6$

ข้อ 21 $y = \dfrac{1}{4}x + 1$

ข้อ 22


$f'(x)$
1
−1
X
−3
−2
−1
0
1
2
3

ข้อ 23


Graphs of functions
กราฟของฟังก์ชัน
Graphs of derivative
กราฟของอนุพันธ์

2.2 Rate of Change
อนุพันธ์ในรูปของการเปลี่ยนแปลง

ข้อ 24 15 meters per second

ข้อ 25

25.1 During the time $t = 0$ to $t = 10$, the population decreases at a larger rate than during the time $t = 30$ to $t = 40$.

25.2 At $t = 30$, the population of panthers decrease at the rate $\frac{2}{5}$ panther per year.

ข้อ 26

26.1 7 cubic meters per second.

26.2 7 cubic meters per second. This means that at the moment when $t = 2$, the volume of the balloon increases at the rate of 7 cubic meters per second.

ข้อ 27

27.1 $\frac{1}{2}(e^{-8} - e^{-4})$ molars per second. This means that from $t = 1$ to $t = 2$, the concentration decreases at the rate of $\frac{1}{2}(e^{-8} - e^{-4})$ molars per second.

27.2 $2e^{-12} + 2$ molars per second. This means that at the moment when $t = 3$, the concentration increases at the rate of $2e^{-12} + 2$ molars per second.

2.3 Derivative Formulas
สูตรการหาอนุพันธ์ของฟังก์ชัน

ข้อ 28 Find $\frac{dy}{dx}$ of the following functions. จงหา $\frac{dy}{dx}$ ของฟังก์ชันต่อไปนี้

28.1 $\dfrac{1}{1+x^2}$

28.2 $111(3x^5+2x-4)^{110}(15x^4+2)$

28.3 $3x^2\cdot(-\sin x)+\cos x\cdot(6x)$

28.4 $\dfrac{3^x\cdot\frac{1}{x\ln 8}-\log_8 x\cdot 3^x\ln 3}{(3^x)^2}$

28.5 $\dfrac{1}{\operatorname{cosec}(3x+4)}\cdot[-\operatorname{cosec}(3x+4)\cot(3x+4)]\cdot 3$

28.6 $4x-\dfrac{1}{x^2}-\dfrac{1}{2\sqrt{2}}+\dfrac{1}{x\ln 3}$

28.7 $4x^3\cdot 2^x\ln x+2^x\cdot 12x^2$

28.8 $\dfrac{(-6x+\sin x)\cdot\left(2\cdot\dfrac{1}{x}\right)-(2\ln x)\cdot(-6+\cos x)}{(-6x+\sin x)^2}$

28.9 $-\sin(3x^2)\cdot(6x)+2\operatorname{cosec}^2(x^4)\cdot(4x^3)$

28.10 $\dfrac{1}{\sqrt{1-x^2}}+\dfrac{1}{1+x^8}\cdot 3x^2$

28.11 $6x^2-\dfrac{3}{2\sqrt{x}}-\dfrac{2}{x^2}$

28.12 $\dfrac{\ln 2}{x^3+1}\cdot(3x^2)$

28.13 $x^2\cdot\sec^2(e^x)\cdot e^x+\tan(e^x)\cdot(2x)$

28.14 $y=\dfrac{\tan^{-1}x\cos x-\sin x\cdot\frac{1}{1+x^2}}{(\sin x)^2}$

ข้อ 29 2561

ข้อ 30

30.1) Correct

30.2) Incorrect, because $g'(x) = f(x)\sec^2 x + \tan x f'(x)$

30.3) Incorrect, because $\frac{d}{d\theta}\left[(\theta + \sin 2\theta)^2\right] = 2(\theta + \sin 2\theta)(1 + 2\cos 2\theta)$

30.4) Incorrect, because $\frac{d^{101}[f(x)]}{dx^{101}} = 100x^{99}$

30.5) Correct

2.4 The Chain Rule
กฎลูกโซ่

ข้อ 31

31.1 -4

31.2 3

31.3 -12

31.4 -3

ข้อ 32

32.1 $e^{f(x)}f'(x)$.

32.2 $16e^{64}$

ข้อ 33

33.1 $e^u \cdot \frac{1}{s} \cdot (2t)$.

33.2 -2.

ข้อ 34 0

ข้อ 35 25

ข้อ 36 $\frac{5}{13}$

ข้อ 37

37.1) 4.

37.2) 2

37.3) $2(x + f(x))(1 + f'(x))$

37.4) 30

2.5 Higher Derivatives
อนุพันธ์อันดับสูง

ข้อ 38 $2\sec^2 x \tan x + 12e^{2x}$

ข้อ 39 $3^x(\ln 3)^3 - 60x^{-60}$

ข้อ 40 0

ข้อ 41 $x^3y + 3xy$