①

$$b(t) = b_0 e^{rt}$$

$$b(1) = 5 = b_0 e^r$$

$$b(2) = 6 = b_0 e^{r \cdot 2} \qquad (e^r)^2$$

$$e^r = \frac{5}{b_0}$$

$$6 = b_0 \left(\frac{5}{b_0}\right)^2$$

$$6 = \frac{5^2}{b_0}$$

$$e^r = \frac{5}{b_0} = \frac{5}{5^2} \cdot 6 = \frac{6}{5}$$

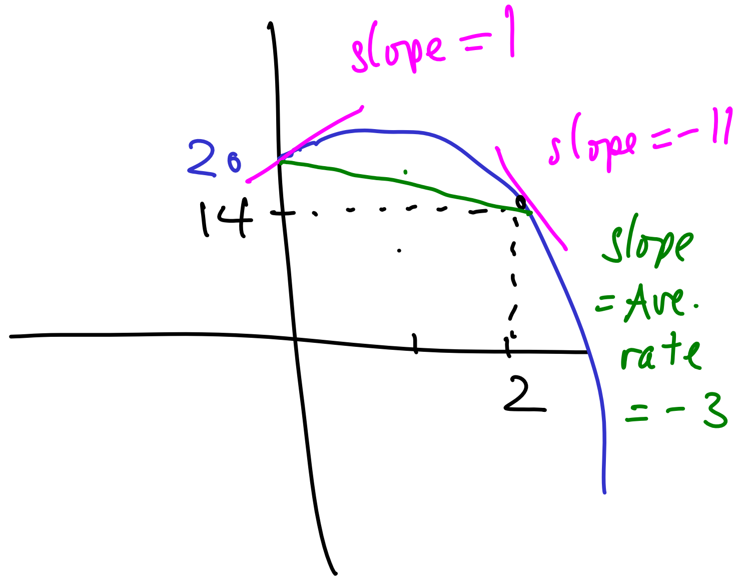
$$b_0 = \frac{5^2}{6} \approx 4.167$$

$$r = \ln\left(\frac{6}{5}\right) \approx 0.18232$$

$$b(t) = b_0 e^{rt} = 4.167\, e^{0.18232\, t}$$

$$b(3) = 4.167\, e^{0.18232 \cdot 3} \approx \boxed{7.2 \text{ mil}}$$

$$s(t) = 20 + t - t^3$$



a) $s(0) = 20$

$s(2) = 14$

$$s'(t) = \lim_{h \to 0} \frac{s(t+h) - s(t)}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{20} + (\cancel{t}+h) - (t+h)^3 - (\cancel{20} + \cancel{t} - t^3)}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{h} - \cancel{t^3} - 3t^2\cancel{h} - 3th^{\cancel{2}} - \cancel{h^3}^{\,2} + \cancel{t^3}}{\cancel{h}}$$

$$= \lim_{h \to 0} (1 - 3t^2 - 3th - h^2) = \boxed{1 - 3t^2}$$

b) $s'(0) = 1$, $s'(2) = -11$

c) Ave. rate: $\dfrac{\Delta s}{\Delta t} = \dfrac{14 - 20}{2 - 0} = \boxed{-3}$

③ $f(x) = 27 - 3x^2$

$$f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h} = \lim_{h\to 0} \frac{\cancel{27} - 3(x+h)^2 - (\cancel{27} - 3x^2)}{h}$$

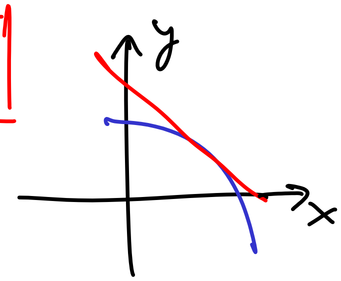
$$= \lim_{h\to 0} \frac{-\cancel{3x^2} - 6x\cancel{h} - 3h^{\cancel{2}} + \cancel{3x^2}}{\cancel{h}}$$

$$= \lim_{h\to 0} (-6x - 3h) = \boxed{-6x}$$

$$y(x+h) = y(x) + y'(x)h + \cancel{\varepsilon}$$

$$\underbrace{y(2+h)}_{x} = y(2) + y'(2)h = 15 - 12h$$

$$y = 15 - 12(x-2) = \boxed{39 - 12x}$$



4) a) $\lim\limits_{n\to\infty} \frac{n}{3n+2} = \lim\limits_{n\to\infty} \frac{1}{3+\frac{2}{n}}$

$= \frac{1}{3+2\lim\limits_{n\to\infty}\frac{1}{n}} = \frac{1}{3+2\cdot 0} = \frac{1}{3}$

b) $\lim\limits_{x\to 1} \frac{1-x}{1-x^2} = \lim\limits_{x\to 1} \frac{\cancel{1-x}}{\cancel{(1-x)}(1+x)}$

$= \lim\limits_{x\to 1} \frac{1}{1+x} = \frac{1}{2}$

c) $\lim\limits_{x\to 0} x^2 \cos\left(\frac{1}{x}\right) = 0$

Sandwich: $-1 \le \cos\left(\frac{1}{x}\right) \le 1$

$-x^2 \le x^2\cos\left(\frac{1}{x}\right) \le x^2$

0

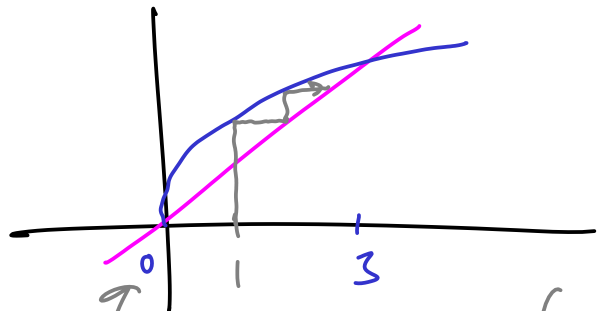
d) $\lim\limits_{x\to 0} \frac{x}{\sin(2x)} =$

$= \lim\limits_{x\to 0} \frac{2x}{\sin(2x)} \cdot \frac{1}{2} = 1 \cdot \frac{1}{2} = \frac{1}{2}$

⑤ $$x_{t+1} = \sqrt{3x_t}$$

Fixed pts: $x = \sqrt{3}\sqrt{x}$

$x = 0$ or $\sqrt{x} = \sqrt{3}$, $x = 3$



unstable (repelling)

stable (attracting)

If $x_0 = 0$, $x_n = 0$ for all n

If $x_0 = 1$, $x_n \to 3$ as $n \to \infty$