HW3-10

① $f(x) = x^4 + x^2 - 1$

$f'(x) = 4x^3 + 2x$; $f'(1) = 6$

points $(x,y) \to (1,1)$

$1 = 6 + b$; $b = -5$

$linear(x) = 6x - 5$

③ $f'(x) = 2f(x) + 5x$

$f'(3) = 2f(3) + 15 = 23$

$4 = 23(3) + b$; $b = -65$

$linear(x) = 23x - 65$

$L(3.008) \approx 4.184$

④ $f(x) = 1/x$; $f'(x) = -1/x^2$

$f'(0.2) = -1/0.04 = -25$

$f(0.2) = 1/0.2 = 5$

$5 = -25\left(\frac{2}{10}\right) + b$; $b = 10$

$linear(x) = -25x + 10$

$L(0.202) \approx 4.95$

⑤ $f(x) = \sin x$; $f(\pi/3) = \sqrt{3}/2$

$f'(x) = \cos x$; $f'(\pi/3) = 1/2$

$\frac{\sqrt{3}}{2} = \frac{1}{2}\left(\frac{\pi}{3}\right) + b$; $b = \frac{\sqrt{3}}{2} - \frac{\pi}{6}$

$linear(x) = \frac{1}{2}x + \sqrt{3}/2 - \pi/6$

$L(0.99) \approx 0.8398$

$57°$ in radians is 0.9948

⑥ $f(x) = \ln(x)$; $f(1) = 0$

$f'(x) = 1/x$; $f'(1) = 1$

$0 = 1(1) + b$; $b = -1$

$linear(x) = x - 1$

$L(1.05) \approx 0.05$ then

⑦ $f(x) = x^{1/3}$; $f(1) = 1$

$f'(x) = \frac{1}{3}x^{-2/3}$; $f'(x) = 1/3$

$1 = \frac{1}{3}(1) + b$; $b = \frac{2}{3}$

$linear_2(x) = \frac{1}{3}x + \frac{2}{3}$

$L(1.11) \approx 1.03667$

② $V = \frac{2}{3}\pi r^3$; $r = 3000\,cm$; $v(r) = 1.8\pi \times 10^{10}$

$v'(r) = 2\pi r^2$; $v'(3000) = 1.8\pi \times 10^7$

$1.8\pi \times 10^{10} = 1.8\pi \times 10^7 (3000) + b$ then

$b = -3.6\pi \times 10^{10}$

$L(x) = 1.8\pi \times 10^7 x - 3.6\pi \times 10^{10}$

$L(3000 + 0.02) \approx$ forget this shit

② $V = \frac{2}{3}\pi r^3$; $dV = 2\pi r^2 dr$ where $dr = 0.02$

and radius $\approx 1500\,cm$

then $dV \approx 2\pi (1500)^2 (0.02) \approx 282743$

Homework 3-10

⑧ $S = 2lw + 2lh + 2hw$; l w h : $100 \times 90 \times 90$

$dS = 2dl\,w + 2l\,dw + 2dl\,h +$
$2l\,dh + 2dh\,w + 2h\,dw$

dl & dh & $dw = 0.2$

$dS = 4/10(90) + 4/10(100) + 4/10(90)$
$4/10(100) + 4/10(90) + 4/10(90)$

$dS = 36(4) + 40(2) = 224$