$\lim_{h\to 0} \frac{2x^3 + 6x^2h + \cdots}{h}$ $= 2x^2 = 2(2)^2 = 24$ $F(0) = 0$ $F(2) = 54$

$F'(x) = 6x^2$

End of Day 1 questions

3.4 - Day 2 # 19, 21, 23, 33-36

(19) a) $m = \frac{35-15}{5-3} = \frac{20}{2} = 10$ (3, 15)

$y = 10x + b$

$15 = 10(3) + b$

$15 = 30 + b$

$-15 = b$

$y = 10x - 15$ Secant equation

b) $F'(x) = \lim_{h\to 0} \frac{(x+h)^2 + 2(x+h) - (x^2+2x)}{h}$

$= \lim_{h\to 0} \frac{x^2 + 2xh + h^2 + 2x + 2h - x^2 - 2x}{h}$

$= \lim_{h\to 0} \frac{2xh + h^2 + 2h}{h} = \lim_{h\to 0} 2x + h + 2$

$f'(x) = 2x + 2$ $F'(3) = 8$

$y - 15 = 8(x-3) \rightarrow y = 8x - 24 + 15 \rightarrow$ $y = 8x - 9$ equation of tangent line

(21) a) $f(5)=1 \quad f(2)=\frac{5}{2}$

$m=\frac{1-\frac{5}{2}}{5-2}=\frac{-\frac{3}{2}}{3}=-\frac{1}{2}$

$y-1=-\frac{1}{2}(x-5)$

$y=-\frac{1}{2}x+\frac{7}{2}$ equation of secant

b) $f'(x)=\lim_{h\to 0}\frac{\frac{5}{x+h}-\frac{5}{x}}{h}$

$=\lim_{h\to 0}\frac{5x-5x-5h}{x(x+h)}\Big/h=\lim_{h\to 0}\frac{-5h}{x(x+h)}\cdot\frac{1}{h}$

$=\lim_{h\to 0}\frac{-5}{x(x+h)} \Rightarrow f'(x)=-\frac{5}{x^2}$

$f'(2)=-\frac{5}{4} \quad y-\frac{5}{2}=-\frac{5}{4}(x-2)$

$y=-\frac{5}{4}x+\frac{5}{2}+\frac{5}{2} \Rightarrow y=-\frac{5}{4}+5$ tangent Line

(23) a) $f(16)=16 \quad f(9)=12$

$m=\frac{16-12}{16-9}=\frac{4}{7}$

$y-12=\frac{4}{7}(x-9)$

$y-12=\frac{4}{7}x-\frac{36}{7}$

$y=\frac{4}{7}x-\frac{36}{7}+\frac{84}{7}$

$y=\frac{4}{7}x+\frac{48}{7}$ Secant Line

b) $f'(x)=\lim_{h\to 0}\frac{4\sqrt{x+h}-4\sqrt{x}}{h}\cdot\frac{(4\sqrt{x+h}+4\sqrt{x})}{(4\sqrt{x+h}+4\sqrt{x})}$

$=\lim_{h\to 0}\frac{16(x+h)-16x}{4h(\sqrt{x+h}+\sqrt{x})}=\lim_{h\to 0}\frac{16h}{4h(\sqrt{x+h}+\sqrt{x})}$

$\lim_{h\to 0}\frac{4}{\sqrt{x+h}+\sqrt{x}} \Rightarrow f'(x)=\frac{2}{\sqrt{x}}$

$f'(9)=\frac{2}{3} \rightarrow y-12=\frac{2}{3}(x-9)$

$y-12=\frac{2}{3}x-6 \rightarrow y=\frac{2}{3}x+6$ tangent Line

(33) $x=0$ (34) $x=-6$ (35) $x=-3 \quad x=-1 \quad x=0$
$x=-3 \quad x=5$

(36) $x=-5 \quad x=-3 \quad x=0$
$x=2 \quad x=4$