8. $-1 \le \cos\frac{4}{x} \le 1$

$-\frac{1}{6}x^2 \le \frac{1}{6}x^2\cos\frac{4}{x} \le \frac{1}{6}x^2$

$-\frac{1}{6}x^2+5 \le \frac{1}{6}x^2\cos\frac{4}{x} \le \frac{1}{6}x^2+5$

$5 \quad \lim_{x\to 0}\frac{1}{6}x^2\cos\frac{4}{x}+5 = 5$

$$f(x) = \frac{(x+8)(x+1)(x-4)\,|x-3|}{x(x+8)(x+1)(x-4)(x-5)(x-3)}$$

$$f(x) = \begin{cases} \dfrac{(x+8)(x+1)}{x(x+8)(x+1)}, & x \le 3 \\ \dfrac{(x-4)}{(x-4)(x-5)}, & x > 3 \end{cases}$$

$$f(x) = \begin{cases} x+1 & 1<x<3 \\ x^2+bx+c & |x-2|\geq 1 \end{cases} = \begin{cases} x^2+bx+c, & x\leq 1 \\ x+1, & 1<x<3 \\ x^2+bx+c, & x\geq 3 \end{cases}$$

$|x-2|\geq 1$

$x-2\geq 1$ or $x-2\leq -1$

$x\geq 3$ or $x\leq 1$

$x=1$

$1^2+b+c=1+1$

$b+c=1$

$x=3$

$3+1=3^2+3b+c$

$-5=-3b+c$

$1=b+c$

$-6=2b$

$b=-3$

$c=1-(-3)$

$=4$

2.2

52. $f(x) = \frac{2}{\sqrt[3]{x}} + 3\cos x$

$= 2x^{-1/3} + 3\cos x$

$f'(x) = -\frac{2}{3}x^{-4/3} - 3\sin x$

$= \frac{-2}{3\sqrt[3]{x^4}} - 3\sin x$

$\frac{-2}{3x\sqrt[3]{x}} - 3\sin x$

91. $s(t) = -16t^2 + v_0 t + s_0$

(a) $s(t) = -16t^2 + 1362$

$v(t) = s'(t) = -32t$ instantaneous velocity $\frac{ds}{dt}$

(b) average velocity $[1,2]$

$$\frac{\Delta s}{\Delta t} = \frac{s(2) - s(1)}{2-1} = \frac{-16(2)^2 + 1362 - (-16(1)^2 + 1362)}{1}$$

$= -16(4) + 16$

$= -16(3) = \boxed{-48 \text{ ft/s}}$

find equation of tangent line

$f(x) = 2x^3 + \sin x - 2x$; find equation of tangent line @ point $(0,0)$

$f'(x) = 6x^2 + \cos x - 2$

$m = f'(0) = 6(0)^2 + \cos 0 - 2$

$= 0 + 1 - 2 = -1$

$y - y_1 = m(x - x_1)$

$y - 0 = -1(x - 0)$

$y = -x$

2.1

#29-32

2.3 Product & Quotient Rules

$$(fg)' = f'g + fg'$$

$$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2} = \frac{gf' - fg'}{g^2}$$

"low dee high less high dee low
draw the line and square below"