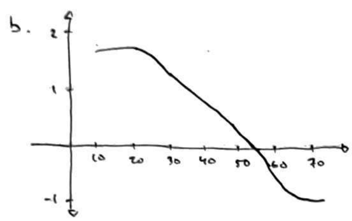
James Ding

AP Calculus AB: HW 2.2B

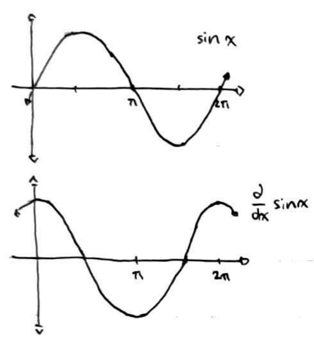
14. a. F'(v) represents the rate of change of fuel economy at v miles per hour.

b.



c. You should idealy drive about 55 mph

20.



$\frac{d}{dx}\sin x$ looks similiar to $\cos x$

20. $\lim_{h\to0}\frac{m(x+h)+b-(mx+b)}{h}$

$= \lim_{h\to0}\frac{mx+mh+b-mx-b}{h}$

$= \lim_{h\to0}\frac{mh}{h}$

$= \lim_{h\to0} m$

$\boxed{= m \;;\; \text{Domain: } \mathbb{R}}$

24. $\lim_{h\to0}\frac{\frac{1}{\sqrt{x+h}}-\frac{1}{\sqrt{x}}}{h}$

$= \lim_{h\to0}\frac{\left(\frac{1}{\sqrt{x+h}}-\frac{1}{\sqrt{x}}\right)\left(\frac{1}{\sqrt{x+h}}+\frac{1}{\sqrt{x}}\right)}{h\left(\frac{1}{\sqrt{x+h}}+\frac{1}{\sqrt{x}}\right)}$

cont'd ↗

24. cont'd.

$= \lim_{h\to0}\frac{\frac{1}{x+h}-\frac{1}{x}}{h\left(\frac{1}{\sqrt{x+h}}+\frac{1}{\sqrt{x}}\right)}$

$= \lim_{h\to0}\frac{x-(x+h)}{h(x(x+h))\left(\frac{1}{\sqrt{x+h}}+\frac{1}{\sqrt{x}}\right)}$

$= \lim_{h\to0}\frac{h}{h(x^2+xh)\left(\frac{1}{\sqrt{x+h}}+\frac{1}{\sqrt{x}}\right)}$

$= \lim_{h\to0}\frac{1}{(x^2+xh)\left(\frac{1}{\sqrt{x+h}}+\frac{1}{\sqrt{x}}\right)}$

$= \frac{1}{(x^2+0)\left(\frac{1}{\sqrt{x}}+\frac{1}{\sqrt{x}}\right)}$

$= \frac{1}{x^2\left(\frac{2}{\sqrt{x}}\right)}$

$= \frac{1}{\frac{2x^2}{\sqrt{x}}}$

$= \frac{\sqrt{x}}{2x^2}$

$= 2x^{-3/2}$

Domain of $g(t)$: $t \in (0,\infty)$

Domain of $g'(t)$: $t \in (0,\infty)$

36.

Temp	15.5	17.7	20.0	22.4	24.4
W'(x)	-2.818	-3.86	-4.53	-6.72	-9.75

Units would be grams/celcius

40. -1, removable discontinuity

2, cusp

42. -2, cusp

1, discontinuity

3, cusp

50. d is position, as position is constantly increasing

c. is velocity, as it remains constant as position grows towards the end of t.

b. is acceleration, it is 0 when velo is constant.

a. Jerk is a, as it is deriv of b.

62. a. $f'_-(4)$:

$$\lim_{h\to 0^-} \frac{5-(4+h)-1}{h}$$

$$= \lim_{h\to 0^-} \frac{5-4-h-1}{h}$$

$$= \lim_{h\to 0^-} -\frac{h}{h}$$

$$= \lim_{h\to 0^-} -1$$

$$= -1$$

$f'_+(4)$

$$\lim_{h\to 0^+} \frac{\frac{1}{5-(4+h)}-1}{h}$$

$$= \lim_{h\to 0^+} \frac{\frac{1}{1-h}-1}{h}$$

$$= \lim_{h\to 0^+} \frac{\frac{1}{1-h}-\frac{1-h}{1-h}}{h}$$

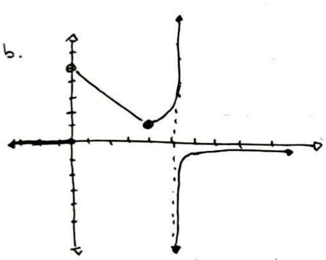
$$= \lim_{h\to 0^+} \frac{1-(1-h)}{h(1-h)}$$

$$= \lim_{h\to 0^+} \frac{h}{h(1-h)}$$

$$= \lim_{h\to 0^+} 1$$

$$= 1$$

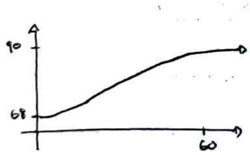
b.



c. $x=0, 5$

d. $x=0, 4, 5$

64. a.



b. It would probably change at a constant rate, until target temp is met.

c.