1. If $f'(c)=0$, then f has a local max or min at c.

FALSE eg. $f(x)=x^3$ when $c=0$.

2. If f has an absolute minimum value at c, then $f'(c)=0$.

FALSE $f(x)=|x|$ at $c=0$.

5. If $f'(x)<0$ for $1<x<6$, then f is decreasing on $(1,6)$.

TRUE

8. There is a function f such that $f(1)=-2$, $f(3)=0$ and $f'(x)>1$ for all x.

* Okay, if f' isn't defined everywhere, this statement could be true, but the fact that they write it like $f'(x)>1$ tells me that they are thinking that f' is defined everywhere *.

FALSE Mean Value Theorem.

Average rate of change: $\frac{0+2}{3-1}=1$.

By MVT, there must be an x between 1 and 3 such that $f'(x)=1$.

11. If f and g are increasing on an interval, then $f+g$ is increasing on I.

TRUE.

12. If f and g are increasing on an interval, then $f-g$ is increasing on that interval.

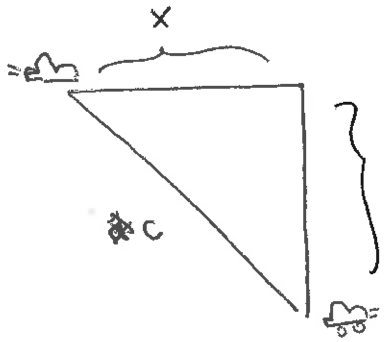
FALSE If $g'(x)>f'(x)>0$ then

$(f-g)'(x)=f'(x)-g'(x)<0$, and

so this function is decreasing.

2.8 #15, 16

15.



we have

$\frac{dy}{dt} = 60\text{mph}$

$\frac{dx}{dt} = 25\text{mph}.$

want $\frac{dc}{dt}$ when $t = 2$ hours

so that $y = 120$ and

$x = 50$ and

$c = \sqrt{120^2 + 50^2}$

$= 130.$

$$x^2 + y^2 = c^2$$

$$\Rightarrow 2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 2c\frac{dc}{dt}.$$

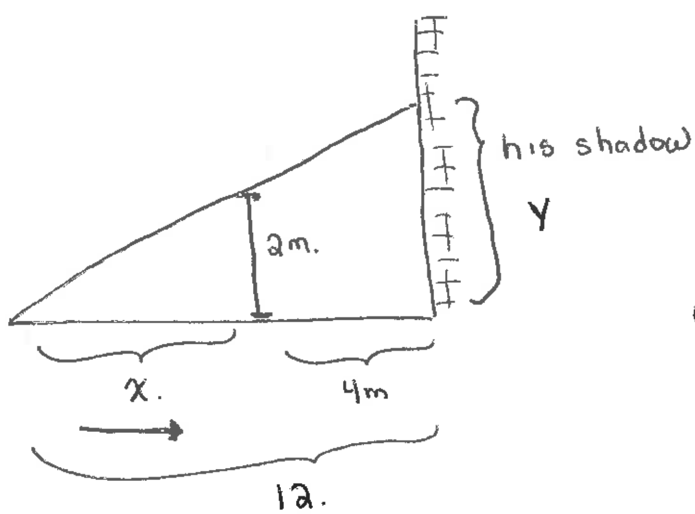
plug in.

$$2(50)(25) + 2(120)(60) = 2(130)\frac{dc}{dt}.$$

$$\Rightarrow \frac{dc}{dt} = 65 \text{ mph}.$$

The distance between the cars is changing at 65mph.

16.



we have $\frac{dx}{dt} = 1.6$ m/sec

want : $\frac{dy}{dt} = ?$ when

$x = 8.$

$y = 3.$

similar triangles $\Rightarrow \frac{y}{12} = \frac{2}{x} \Rightarrow \boxed{xy = 24.}$

and differentiate: $\frac{d(xy)}{dt} = 0$

$$\frac{dx}{dt}y + \frac{dy}{dt}x = 0$$

plug in: $(1.6)(3) + \frac{dy}{dt}(8) = 0$

$$\boxed{\frac{dy}{dt} = -.6.}$$

The height of the shadow is <u>decreasing</u> at a rate of 0.6 m/sec.

$f(x) = x + 2\cos x \quad (-\pi, \pi)$

critical points:

$f'(x) = 1 - 2\sin x$. when is $f'(x) = 0$?

$\Rightarrow 1 = 2\sin x$

$\sin x = 1/2$

$\Rightarrow x = \frac{\pi}{6}$ and $\frac{5\pi}{6}$

2^{nd} derivative test:

$f''(x) = -2\cos x$

$\Rightarrow \underbrace{f''(\pi/6) < 0}_{\text{concave down}}$ and $\underbrace{f''(5\pi/6) > 0}_{\text{concave up}}$

$\boxed{\Rightarrow \pi/6 \text{ is local max}}$ $\boxed{\Rightarrow 5\pi/6 \text{ is local min}}$

Absolute max/min:

Find

$f(-\pi)$, $f(\pi)$, $f(\pi/6)$ and $f(5\pi/6)$,

the largest value is the absolute max and the smallest value is absolute min.