12|5|16 AUTUM 2015

2g

7b, c

1e

6

$g = f^2$ $g'(x) = 2f(x)f'(x)$

1, 3, 6

2e $\lim_{x \to 0} \frac{f(1+x) - f(1)}{x - 0} = f'(1) = 10$

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

$f(1+x) \to 0$

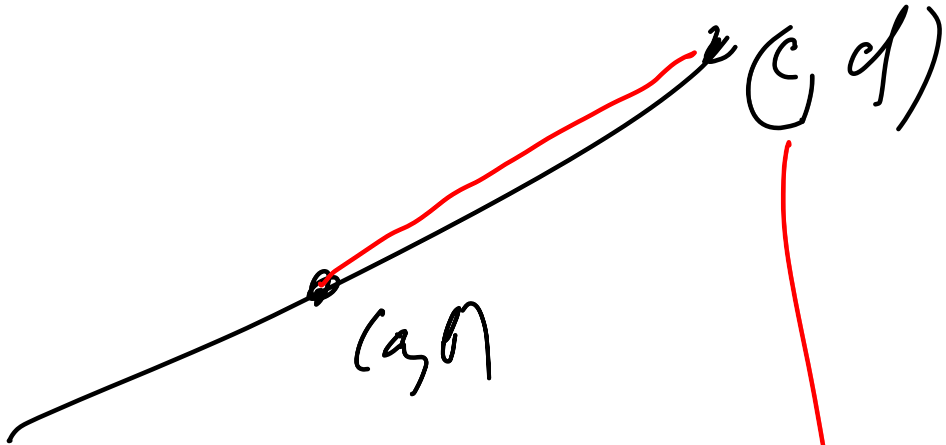
$x \to 0$

$$\lim_{x \to 0} \frac{f(1+x)}{x} = 10$$

by L'H.

$\frac{f'(1+x)}{1} \to 10$

$1+$



$$\frac{d - b}{c - a}$$

$x, f(x)$

$[1, f(1)]$

$$\frac{f(x) - f(1)}{x - 1}$$

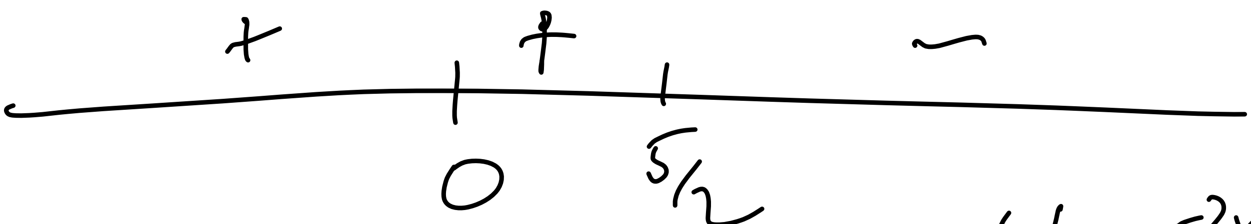
$$f = x^5 e^{-2x}$$

$$f'(x) = 5x^4 e^{-2x} + x^5\left(-2e^{-2x}\right)$$

$$= x^4 e^{-2x}\left[5 - 2x\right]$$

C.P: $x = 0$ $\quad x = 5/2$

$f(0) = 0 \qquad f(5/2) = (5/2)^5 e^{-5}$



$$f''(x) = 4x^3\left[e^{-2x}\right]\left[5-2x\right] + x^4\left(-2e^{-2x}\right)\left[5-2x\right] + x^4 e^{-2x}(-2)$$

$$= x^3 e^{-2x}\left[20 - 8x - 10x + 4x^2 - 2x\right]$$

$$= x^3 e^{-2x}\left[4x^2 - 20x + 20\right] = 4x^3 e^{-2x}\left[x^2 - 5x + 5\right]$$

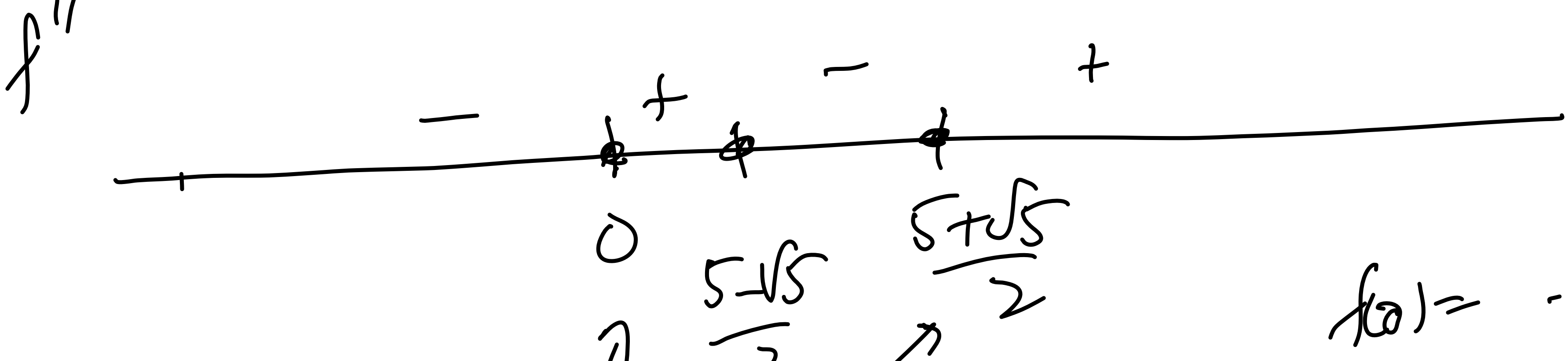
$$f'' = 4x^3 e^{-2x}\left[x^2 - 5x + 5\right]$$

$$x^2 - 5x + 5 = 0 \qquad x = \frac{5 \pm \sqrt{25-20}}{2}$$

$$\|$$

$$(x-a)\underline{(x-b)} \quad (a \neq b) \qquad = \frac{5 \pm \sqrt{5}}{2}$$

changes sign at a.



$f'' = 0$

$f(0) = \ldots$ —

$f\left(\frac{5-\sqrt{5}}{2}\right) =$ —

$f\left(\frac{5+\sqrt{5}}{2}\right) = \ldots$

Infl. pts:

$$\left(0, f(0)\right) \qquad \left(\frac{5-\sqrt{5}}{2}, f\left(\frac{5-\sqrt{5}}{2}\right)\right) \qquad \left(\frac{5+\sqrt{5}}{2}, f\left(\frac{5+\sqrt{5}}{2}\right)\right)$$

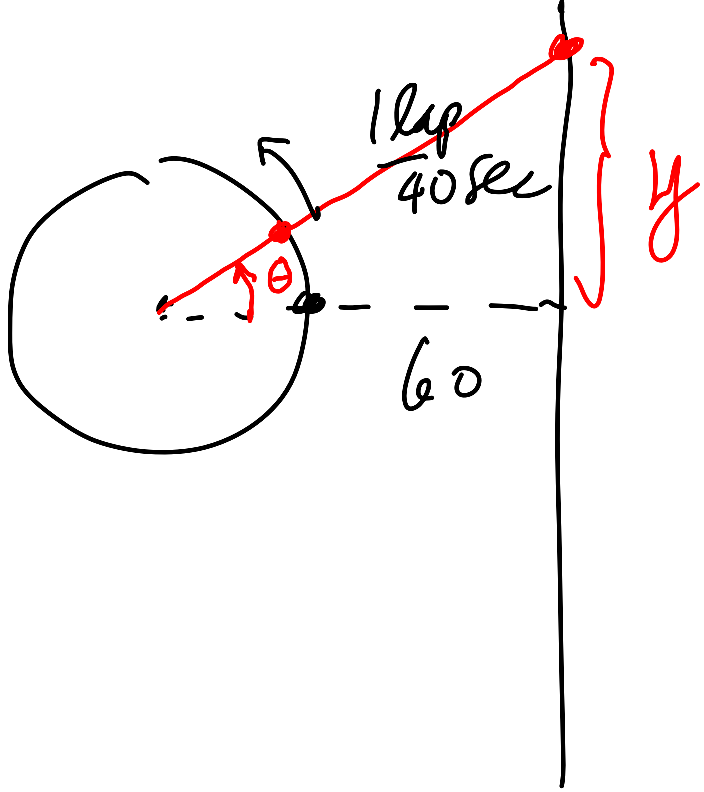
$$\lim_{x\to\infty} \frac{x+\sin x}{x\ln x}\left(2x+1\right)$$

$$\frac{(x+\sin x)(2x+1)}{x\ln x} = \frac{\cancel{x^2}\left[1+\frac{\sin x}{x}\right]\left[2+1/x\right]}{\cancel{x^2}\left[\frac{\ln x}{x}\right]}.$$

$$\lim_{x\to\infty} \frac{\ln x}{x} = 0 \quad \text{by L'Hospital.}$$

$$\left.\begin{array}{l} \ln x \to \infty \\ x \to \infty \\ \frac{1/x}{1} \to 0 \\ 1 \neq 0 \end{array}\right\}$$

$\to \infty$ as $x \to \infty$



want $\frac{dy}{dt}$ when

C. $1/12$ of the way around

$$\frac{d\theta}{dt} = \frac{2\pi \text{ rad}}{40 \text{ sec}}$$

$$\tan\theta = \frac{y}{60}$$

$$\theta = \frac{2\pi}{12}$$

$$\tan\frac{\pi}{6} = \frac{y}{60}$$

$$\sec^2\theta \, \frac{d\theta}{dt} = \frac{1}{60}\frac{dy}{dt}$$

$$\left[1+\left(\frac{y}{60}\right)^2\right]\frac{\pi}{20} = \frac{1}{60}\frac{dy}{dt}$$