10.4
#17, 21

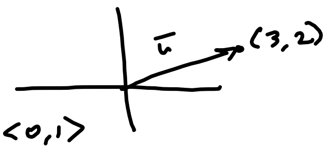
Polynomials are DENSE in the family of cnt's (or dif b'l) functions)

I can build a sequence of polynomials that converges to any differentiable function.

$1, x, x^2, x^3, x^4, \dots$ is a "basis" for the set

$\langle 1,0\rangle, \langle 0,1\rangle$

$\bar{u} = \langle 3,2\rangle$



$\bar{u} = 3\langle 1,0\rangle + 2\langle 0,1\rangle$

$$e^x = 1 + x + \frac{x^2}{2} + \frac{x^3}{6} + \frac{x^4}{24} + \cdots + \frac{x^n}{n!} + \cdots = \sum_{k=0}^{\infty} \frac{x^k}{k!}$$

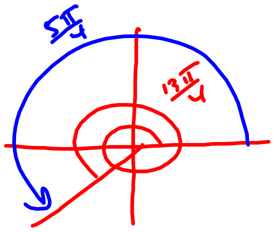
$$\lim_{n\to\infty} \boxed{\sum_{k=1}^{n} \frac{x^k}{k!}} = e^x$$

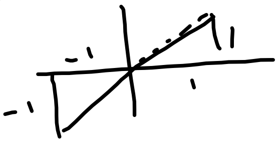
n^{th} partial sum.

#17 Note intersection @ pole isn't a "collision" (Different θ's)

$\cos(3\theta) = \sin(3\theta)$ $\qquad 0 \le \theta < 2\pi \rightarrow 0 \le 3\theta < 6\pi$

$\frac{\cos(3\theta)}{\sin(3\theta)} = 1 = \cot(3\theta)$





$3\theta = \frac{\pi}{4}, \frac{5\pi}{4}, \cancel{\frac{7\pi}{4}}, \frac{9\pi}{4}, \cancel{\frac{11\pi}{4}}, \frac{13\pi}{4}, \cancel{\frac{15\pi}{4}}, \frac{17\pi}{4}$

$\frac{3\pi}{4}$

$\theta = \frac{\pi}{12}, \frac{5\pi}{12}, \cancel{\frac{7\pi}{12}}, \frac{9\pi}{12}, \cancel{\frac{11\pi}{12}}, \frac{13\pi}{12}, \cancel{\frac{15\pi}{12}}, \frac{17\pi}{12}$

No. By graph. But what's the argument?

$\frac{17\pi}{12} = \frac{16\pi}{12} + \frac{\pi}{12}$

$= \frac{4\pi}{3} + \frac{\pi}{12}$

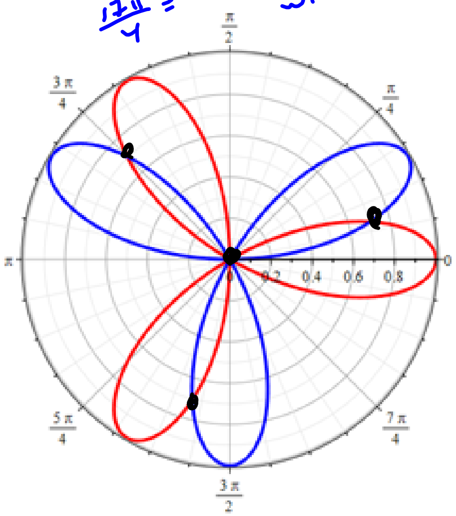
$\frac{17\pi}{4} = 4\pi + \frac{\pi}{4}$. coterminal w/ $\frac{\pi}{4} \rightsquigarrow \frac{\pi}{12}$

No, stove. Add π to each, not $\frac{\pi}{2}$!

$\frac{13\pi}{12}$ & $\frac{17\pi}{12}$ were/are redundant, corresponding to $\frac{5\pi}{12}$ & $\frac{\pi}{12}$, respectively.

$\cos\left(\frac{3\pi}{12}\right) = \cos\frac{\pi}{4} = \frac{1}{\sqrt{2}}$

$\left(\frac{1}{\sqrt{2}}, \frac{\pi}{12}\right)$, etc.



21. 0/2 points

(a) Use this formula to show that the area of the surface generated by rotating the polar curve

$$r = f(\theta) \qquad a \le \theta \le b$$

(where f' is continuous and $0 \le a < b \le \pi$) about the polar axis is

$$S = \int_a^b 2\pi r \sin(\theta) \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\, d\theta.$$

Recall S.A. $= 2\pi \int_a^b y\, ds$ for revolving about the x-axis

polar axis $\longleftrightarrow$ x-axis

$$y = r\sin\theta$$

$$ds = \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\, d\theta$$

See? We're just doing the same thing.

WRITE MUCH.
THINK LITTLE.