数 学 作 业 纸

（科目：Calculus）

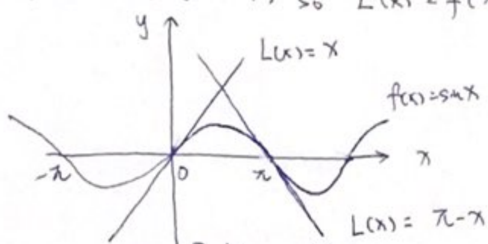
班级：CST01 姓名：[handwritten name] 编号：202001089 第 1 页

Problem Set A.

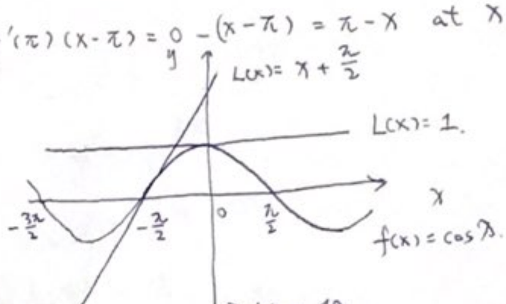
11. Sol. $f(x)=\sin x \Rightarrow f'(x)=\cos x$

(a) $f'(0)=\cos 0=1$, then $L(x)=f(0)+f'(0)(x-0)=0+1\cdot(x)=x$ at $x=0$

(b) $f'(\pi)=\cos\pi=-1$, so $L(x)=f(\pi)+f'(\pi)(x-\pi)=0-(x-\pi)=\pi-x$ at $x=\pi$



Problem 11.



Problem 12

12 Sol.. $f(x)=\cos x \Rightarrow f'(x)=-\sin x$

(a) $f'(0)=-\sin x=0$, so $L(x)=f(0)+f'(0)(x-0)=1$ at $x=0$.

(b) $f'(-\frac{\pi}{2})=-\sin(-\frac{\pi}{2})=1$, so $L(x)=f(-\frac{\pi}{2})+f'(-\frac{\pi}{2})(x+\frac{\pi}{2})=x+\frac{\pi}{2}$ at $x=-\frac{\pi}{2}$

Problem set B.

15. Sol. $L(x)=f(0)+f'(0)(x-0)=1+\left(k(1+x)^{k-1}\Big|_{x=0}\right)\cdot(x-0)=1+kx$.

17 Sol. a. $(1.0002)^{50}=(1+0.0002)^{50}\approx 1+50\times 0.0002=1.01$

b. $\sqrt[3]{1.009}=(1+0.009)^{\frac{1}{3}}\approx 1+\frac{1}{3}\times 0.009=1.003$

Problem set C.

16. Sol. $f'(x)=-1 \Rightarrow$ no critical points.

with $f(-4)=-(-4)-4=0$ and $f(1)=-1-4=-5$, so the absolute $\begin{cases}\text{maximum}=0 & (x=-4)\\ \text{minimum}=-5 & (x=1)\end{cases}$

17. Sol. $f'(x)=2x \Rightarrow$ critical point at $x=0$.

As $f(-1)=0$, $f(0)=-1$, $f(2)=3$, so the absolute $\begin{cases}\text{maximum}=3 \text{ at } x=2.\\ \text{minimum}=-1 \text{ at } x=0.\end{cases}$

25. Sol. $f'(\theta)=\cos\theta \Rightarrow$ critical point at $x=k\pi-\frac{\pi}{2}(k\in\mathbb{R})$, with $-\frac{\pi}{2}\le x\le\frac{5}{6}\pi$,

we can see $\theta=\frac{\pi}{2}$ is a critical point. ($\theta=-\frac{\pi}{2}$ is not interior to the domain)

As $f(-\frac{\pi}{2})=-1$, $f(\frac{\pi}{2})=1$, $f(\frac{5\pi}{6})=\frac{1}{2}$ the absolute $\begin{cases}\text{maximum}=1 \text{ at } \theta=\frac{\pi}{2}\\ \text{minimum}=-1 \text{ at } \theta=\frac{-\pi}{2}\end{cases}$

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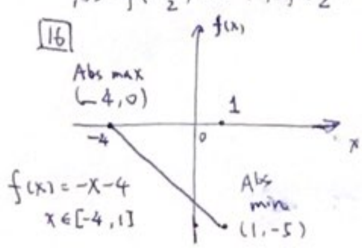

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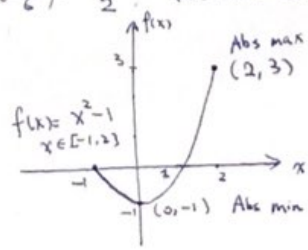

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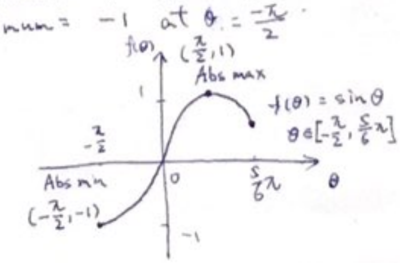

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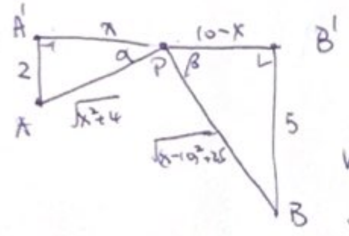
Problem set D.

Sol. 57.



Let $L(x) = |PA| + |PB|$

So $L(x) = \sqrt{x^2+4} + \sqrt{(x-10)^2+25}$

When $L'(x) = \frac{2x}{2\sqrt{x^2+4}} + \frac{2x-20}{2\sqrt{(x-10)^2+25}} = \frac{x}{\sqrt{x^2+4}} - \frac{10-x}{\sqrt{(x-10)^2+25}} = 0$.

which means $\cos\alpha - \cos\beta = 0$. , so $\alpha = \beta$ and

we have $\triangle APA' \sim \triangle BPB'$ thus $\frac{|PA'|}{|AA'|} = \frac{|PB'|}{|BB'|}$

$\Rightarrow \frac{x}{2} = \frac{10-x}{5} \Rightarrow x = \frac{20}{7} = 2.857$ mi

Problem set E.

27. Sol. a. $y' = x \Rightarrow y = \frac{1}{2}x^2 + c$.

b. $y' = x^2 \Rightarrow y = \frac{1}{3}x^3 + C$

c. $y' = x^3 \Rightarrow y = \frac{1}{4}x^4 + C$

29. Sol. a. $y' = -\frac{1}{x^2} \Rightarrow y = \frac{1}{x} + C$

b. $y' = 1 - \frac{1}{x^2} \Rightarrow y = x + \frac{1}{x} + C$

c. $y' = 5 + \frac{1}{x^2} \Rightarrow y = 5x - \frac{1}{x} + C$

31. Sol a. $y' = \sin 2t \Rightarrow y = -\frac{1}{2}\cos 2t + C$

b. $y' = \cos\frac{t}{2} \Rightarrow y = 2\sin\frac{t}{2} + C$.

c. $y' = \sin 2t + \cos\frac{t}{2} \Rightarrow y = -\frac{1}{2}\cos 2t + 2\sin\frac{t}{2} + C$