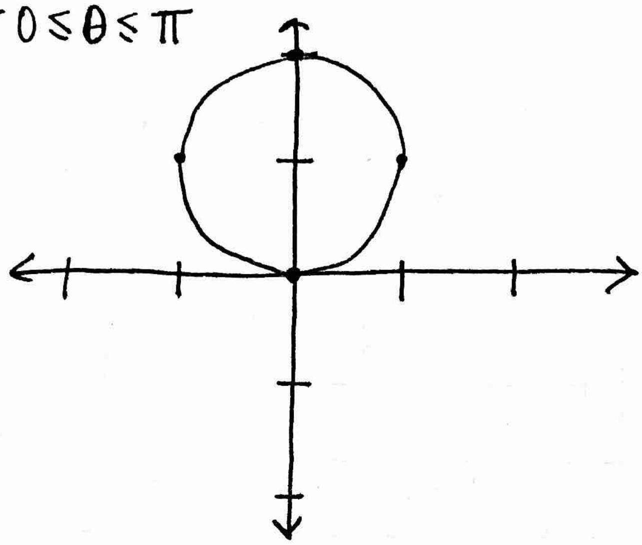
11-76 $r = 2\sin\theta$ for $0 \le \theta \le \pi$

θ	r
0	0
$\pi/4$	$\sqrt{2}$
$\pi/2$	2
$3\pi/4$	$\sqrt{2}$
π	0



a)

θ	slope estimate
0	0 – horizontal
$\pi/4$	undefined – vertical
$\pi/2$	0 – horizontal
$3\pi/4$	undefined – vertical

b) $r = 2\sin\theta$

$r^2 = 2r\sin\theta$

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

$x^2 + y^2 - 2y + 1 = 0 + 1$

$$\boxed{x^2 + (y-1)^2 = 1}$$

Derivative:

$\frac{d}{dx}\left(x^2 + (y-1)^2\right) = \frac{d}{dx}(1)$

$2x + 2(y-1)\frac{dy}{dx} = 0$

$2(y-1)\frac{dy}{dx} = -2x$

$$\boxed{\frac{dy}{dx} = \frac{-x}{y-1}}$$

c) $\theta = 0$ $(0,0)$ $\rightarrow$ $\frac{dy}{dx} = \frac{-0}{0-1} = 0$

$\theta = \pi/4$ $(1,1)$ $\frac{dy}{dx} = \frac{-1}{1-1} = \frac{-1}{0}$ undefined

$\theta = \pi/2$ $(0,2)$ $\frac{dy}{dx} = \frac{-0}{2-1} = 0$

$\theta = 3\pi/4$ $(-1,1)$ $\frac{dy}{dx} = \frac{1}{1-1} = \frac{1}{0}$ undefined.

11-76 d) Step 1: convert the equation to rectangular form
Step 2: Use implicit differentiation to find a formula for $\frac{dy}{dx}$.

11-77 a) $r=\theta$.... $r^2=\theta^2$? no $r^2=\theta r$? no

IMPOSSIBLE TO WRITE IN RECTANGULAR FORM

b) $\frac{dr}{d\theta}$ gives the change in r (distance from pole) as θ changes (moving counterclockwise). This is differeront from $\frac{dy}{dx}$

11-78

a) $x=r\cos\theta$ $y=r\sin\theta$

$r=\theta$

$x=\theta\cos\theta$ $y=\theta\sin\theta$ ← parametric form of the polar equation

b) $\frac{dx}{d\theta}=\cos\theta+\theta(-\sin\theta)$ $\frac{dy}{d\theta}=$ ~~co~~ $\sin\theta+\theta\cos\theta$

$\frac{dy}{dx}=\frac{\sin\theta+\theta\cos\theta}{\cos\theta-\theta\sin\theta}$

c) $\theta=0 \rightarrow \frac{dy}{dx}=\frac{0+0}{1-0}=0$

$\theta=\pi/2 \rightarrow \frac{dy}{dx}=\frac{1+\pi/2(0)}{0-\pi/2(1)}=\frac{1}{-\pi/2}=\frac{-2}{\pi}$

$\theta=\pi \rightarrow \frac{dy}{dx}=\frac{0+\pi(-1)}{-1-\pi(0)}=\frac{-\pi}{-1}=\pi$

d) Convert to parametric form, then compute $\frac{dy}{dx}$ using $\frac{dy/d\theta}{dx/d\theta}$

→

11-79 a) $r=6$

$r^2=36$

$x^2+y^2=36$

$2x+2y\frac{dy}{dx}=0$

$\boxed{\frac{dy}{dx}=\frac{-x}{y}}$

b) $r=3\sin\theta$

$r^2=3r\sin\theta$

$x^2+y^2-3y=0$

$2x+2y\frac{dy}{dx}-3\frac{dy}{dx}=0$

$\frac{dy}{dx}=\frac{-2x}{2y-3}$

parametric version:

$x=r\cos\theta$ $y=r\sin\theta$

$r=3\sin\theta$

$x=3\sin\theta\cos\theta$ $y=3\sin^2\theta$

$\frac{dx}{d\theta}=3(\cos^2\theta-\sin^2\theta)$ $\frac{dy}{d\theta}=6\sin\theta\cos\theta$

$\frac{dy}{dx}=\frac{6\sin\theta\cos\theta}{3(\cos^2\theta-\sin^2\theta)}$

$=\frac{3\cdot\sin 2\theta}{3\ \cos 2\theta}$

$=\boxed{\tan 2\theta}$

c) ~~parametrics~~

$2r\sin\theta+5r\cos\theta=10$

$2y+5x=10$

$y=-\frac{5}{2}x+5$

$\boxed{\frac{dy}{dx}=-\frac{5}{2}}$

d) $r=2\theta$

$x=r\cos\theta$ $y=r\sin\theta$

$x=2\theta\cos\theta$ $y=2\theta\sin\theta$

$\frac{dx}{d\theta}=2[\cos\theta-\theta\sin\theta]$ $\frac{dy}{d\theta}=2[\sin\theta+\theta\cos\theta]$

$\boxed{\frac{dy}{dx}=\frac{\sin\theta+\theta\cos\theta}{\cos\theta-\theta\sin\theta}}$

REVIEW/PREVIEW

11-80 $r=-1+\cos\theta$, $\theta=\pi/2$ tangent line slope $\frac{dy}{dx}$ point (x,y)

→

11-80 $r = -1 + \cos\theta$

$x = r\cos\theta \qquad y = r\sin\theta$

$x = (-1+\cos\theta)\cos\theta \qquad y = (-1+\cos\theta)\sin\theta$

$x = -\cos\theta + \cos^2\theta \qquad y = -\sin\theta + \sin\theta\cos\theta$

$\frac{dx}{d\theta} = \sin\theta + 2\cos\theta(-\sin\theta) \qquad \frac{dy}{d\theta} = -\cos\theta + \cos^2\theta - \sin^2\theta$

$$\frac{dy}{dx} = \frac{-\cos\theta + \cos^2\theta - \sin^2\theta}{\sin\theta - 2\cos\theta\sin\theta}$$

$\theta = \pi/2 \rightarrow \frac{dy}{dx} = \frac{-0+0-1}{1-2(0)(1)} = -1 \leftarrow$ slope

$R = -1 + \cos(\frac{\pi}{2}) = -1$

$x = -1\cos(\frac{\pi}{2}) = 0 \leftarrow$ point $(0,-1)$

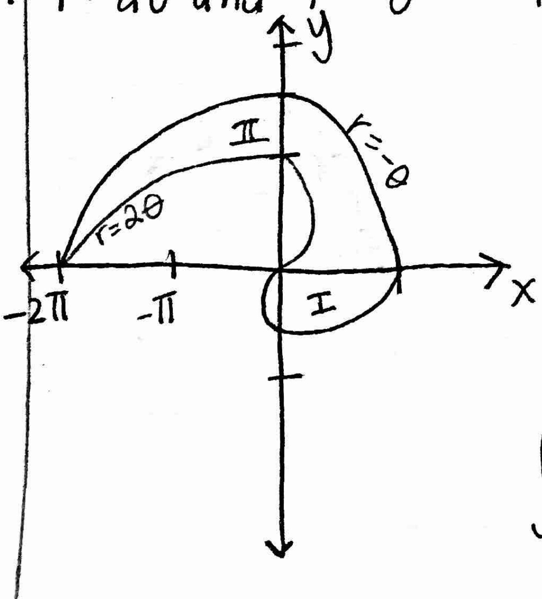
$y = -1\sin(\frac{\pi}{2}) = -1$

$y+1 = -1(x-0)$

$y+1 = -x$

$\boxed{y = -x-1}$

11-81 $r = 2\theta$ and $r = -\theta$



region I: $r=-\theta$ from pole to axis

$\theta = 0$ to $\theta = \pi$

$$\int_0^{\pi} \frac{1}{2}(-\theta)^2 d\theta = \frac{\theta^3}{2\cdot 3}\Big|_0^{\pi} = \frac{\pi^3}{6}$$

region II: outer: $r=-\theta$ from $\theta=\pi$ to $\theta = 2\pi$

inner: $r = 2\theta$ from $\theta=0$ to $\theta=\pi$

$$\int_{\pi}^{2\pi} \frac{1}{2}\theta^2 d\theta - \int_0^{\pi} \frac{1}{2}(2\theta)^2 d\theta = \left(\frac{(2\pi)^3}{6} - \frac{\pi^3}{6}\right) - \frac{4\pi^3}{6}$$

Total: $\frac{4\pi^3}{6} \approx 20.671$

11-82 a) $\int_0^2 \frac{dx}{(x-2)^2}$ ← vertical asymptote @ $x=2$

$= \lim_{b\to 2^-}\left(\int_0^b \frac{dx}{(x-2)^2}\right)$

$= \lim_{b\to 2^-}\left(\frac{-1}{x-2}\Big|_0^b\right)$

$= \lim_{b\to 2^-}\left(\frac{-1}{b-2} - \frac{-1}{-2}\right)$

$= \boxed{\infty \leftarrow \text{diverges}}$

b) $\int \sec^2 x \ln(\tan x)\,dx$ $\quad w=\tan x \quad dw=\sec^2 x\,dx$

$= \int \ln w\,dw$ parts! $\quad u=\ln w \quad dv = dw$
$\quad du = \frac{dw}{w} \quad v = w$

$= w\ln w - \int dw$

$= w\ln w - w$

$= \boxed{\tan x \ln(\tan x) - \tan x + C}$

c) $\int \frac{3}{(x+1)(x+2)}dx \to \frac{3}{(x-1)(x+2)} = \frac{A}{x-1} + \frac{B}{x+2}$

$3 = A(x+2) + B(x-1)$

$x=-2 \to 3 = -3B$
$-1 = B$

$x=1 \to 3 = A(3)$
$1 = A$

$= \int \frac{dx}{x-1} - \int \frac{dx}{x+2}$

$= \boxed{\ln\left|\frac{x-1}{x+2}\right| + C}$

→

11-82d) $\int 6x \tan(x^2)\,dx$ $\qquad u = x^2 \quad du = 2x\,dx$

$3du = 6x\,dx$

$= 3\int \tan u\,du$

$= 3\int \frac{\sin u}{\cos u}\,du \qquad w = \cos u \quad dw = -\sin u\,du$

$= -3\int \frac{dw}{w}$

$= -3\ln|w| + C$

$= -3\ln|\cos u| + C$

$= \boxed{-3\ln|\cos(x^2)| + C}$

11-83 $y = xe^x$ $\qquad$ x-int: $0 = xe^x$ $\quad \boxed{x=0}$ $\qquad$ y-int: $y = 0\cdot e^0$ $\quad \boxed{y=0}$

$y' = e^x + xe^x$

$y' = 0 \rightarrow e^x(1+x) = 0$

$x = -1$

y': $-$ on the left of -1, $+$ on the right of -1 (x axis)

decreasing on $(-\infty, -1)$
increasing on $(-1, \infty)$
relative ~~max~~ min @ $x = -1$

$y'' = e^x + e^x + xe^x$

$y'' = 0 \rightarrow e^x(2+x) = 0$

$x = -2$

y'': $-$ on the left of -2, $+$ on the right of -2

Concave down on $(-\infty, -2)$
Concave up on $(-2, \infty)$
Point of inflection at $x = -2$

11-84 $s = -\ln\left(\frac{1}{t+1}\right)$ meters is the distance traveled after t mins.

a) avg velocity on $0 \le t \le 3$

$v = \frac{ds}{dt}$. avg velocity $= \frac{\Delta s}{\Delta t} = \frac{s(3)-s(0)}{3-0}$ $\boxed{\approx 0.462 \text{ m/min}}$

b) acceleration @ $t=2$

$s = -\ln(t+1)^{-1} = \ln(t+1)$

$\frac{ds}{dt} = v = \frac{1}{t+1}$

$\frac{dv}{dt} = a = \frac{-1}{(t+1)^2}$

$a(2) = \frac{-1}{3^2} = \boxed{\frac{-1}{9} \text{ m/min}^2}$

11-85 @ $x=2$, $f(2)>0$, $f'(2)=0$, $f''(2)<0$

so $f''(2) < f'(2) < f(2)$ $\boxed{E}$

11-86 for $t>0$, $x=(2t-1)^4$, $y=t^2+1$

$\vec{v} = \langle 4\cdot2\cdot(2t-1)^3, 2t\rangle$

$\vec{a} = \langle 4\cdot3\cdot2^2(2t-1)^2, 2\rangle$

$\vec{a}|_{t=1} = \langle 48, 2\rangle$ $\boxed{E}$

11-87 $\frac{x}{x-1} + xy = y^2 - 3x$ slope @ $(2,4)$

$(x-1)^{-1} + x(-1)(x-1)^{-2} + y + x\frac{dy}{dx} = 2y\frac{dy}{dx} - 3$

$(2-1)^{-1} + 2(-1)(2-1)^{-2} + 4 + 2y' = 2(4)y' - 3$

$1 - 2 + 4 \quad + 2y' = 8y' - 3$

$6 = 6y'$ $\boxed{C}$

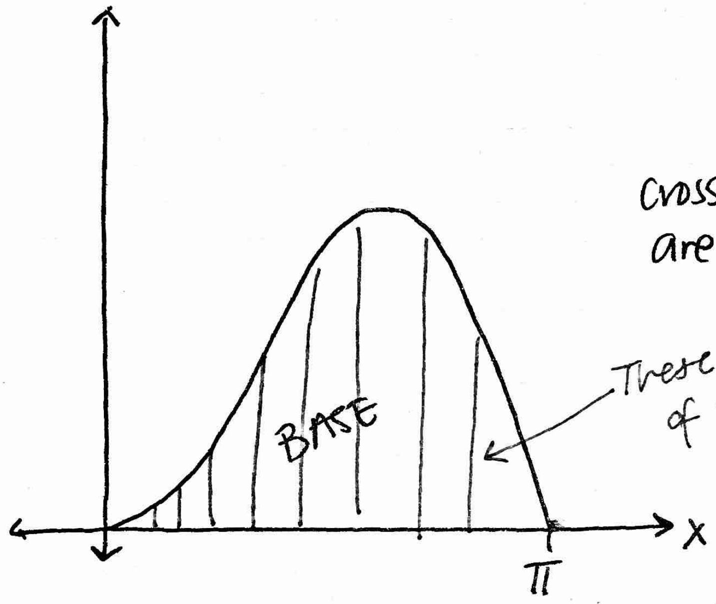
$y' = 1$

11-88 radius of convergence for $\sum_{n=1}^{\infty} n!x^n$

$$\lim_{n\to\infty}\left|\frac{(n+1)!x^{n+1}}{n!x^n}\right| = \lim_{n\to\infty}\left|x(n+1)\right| = \infty \leftarrow \text{~~never finite~~ not} < 1$$

converges <u>never</u>
radius = 0 $\boxed{B}$

11-89 $y = x\sin x$
x-axis on $0 \le x \le \pi$



Cross sections ⊥ to x-axis are semicircles

These are the diameters of the semicircles

$2r = x\sin x$

$r = \frac{x\sin x}{2}$

$\text{semicircle} = \frac{\pi r^2}{2}$

$= \frac{\pi}{2}\left(\frac{x\sin x}{2}\right)^2$

Add up semicircles on $0 \le x \le \pi$:

$\frac{\pi}{8}\int_0^{\pi}(x\sin x)^2 dx \approx \boxed{1.721}$ $\boxed{C}$

11.3.2

11-90

a) $r = 5\cos\theta$

$r^2 = 5r\cos\theta$

$x^2+y^2 = 5x$

$x^2-5x+y^2 = 0$

$2x-5+2yy' = 0$

$2yy' = -2x+5$

$\boxed{y' = \frac{-2x+5}{2y}}$

OR

$x = (5\cos\theta)\cos\theta$

$y = (5\cos\theta)\sin\theta$

$$\frac{\frac{dy}{d\theta}}{\frac{dx}{d\theta}} = \frac{5(-\sin^2\theta+\cos^2\theta)}{5\cdot 2\cos\theta(-\sin\theta)}$$

$$\frac{dy}{dx} = \frac{\cos(2\theta)}{-\sin(2\theta)}$$

$$\boxed{\frac{dy}{dx} = -\cot(2\theta)}$$

b) $r = \frac{2}{\sqrt{\cos\theta\sin\theta}}$

$r^2 = \frac{4}{\cos\theta\sin\theta}$

$(r\cos\theta)(r\sin\theta) = 4$

$xy = 4$

$y+xy' = 0$

$y' = \frac{-y}{x}$

$xy = 4$

$y = 4/x$

$y' = \frac{-y}{x}$

$y' = \frac{-4/x}{x}$

$\boxed{y' = \frac{-4}{x^2}}$

c) $r = 2+3\cos\theta$

$x = (2+3\cos\theta)\cos\theta$ ~~+/2cos~~ $y = (2+3\cos\theta)\sin\theta$

$\frac{dx}{d\theta} = (-3\sin\theta)\cos\theta + (2+3\cos\theta)(-\sin\theta) = -2\sin\theta - 6\sin\theta\cos\theta$

$\frac{dy}{d\theta} = (-3\sin\theta)\sin\theta + (2+3\cos\theta)\cos\theta = 2\cos\theta + 3(\cos^2\theta - \sin^2\theta)$

$$\boxed{\frac{dy}{dx} = \frac{2\cos\theta + 3\cos(2\theta)}{-2\sin\theta - 3\sin(2\theta)}}$$

11-90 d) $r^2 = 4\sin(2\theta)$

$r^2 \cdot r = 4r\sin(2\theta)$

$r^2 \cdot r = 8r\sin\theta\cos\theta$

$r^2 \cdot r^2 = 8r\sin\theta \, r\cos\theta$

$(x^2+y^2)^2 = 8xy$

$(2)(x^2+y^2)(2x+2yy')$ ← I don't like this

$x^4+2x^2y^2+y^4 = 8xy$

$4x^3+2(2xy^2+x^2 2yy')+4y^3y' = 8(y+xy')$

$4x^3+4xy^2+4x^2yy' + 4y^3y' = 8y+8xy'$

$y'(4x^2y+4y^3-8x) = 8y-4x^3-4xy^2$

$$\boxed{y' = \frac{-4xy^2-4x^3+8y}{4x^2y+4y^3-8x}}$$

11-91 $r_1 = 1+\cos\theta$ $\quad r_2 = 5(1+\cos\theta)$ ← cardioids of different sizes

a) since the radius is just bigger by a factor of 5, r_2 is just a dilation ... 5 times bigger.
So, for any angle θ, the slope $\frac{dy}{dx}$ should be the same for both graphs.

b) $r = a(1+\cos\theta)$ find $\frac{dy}{dx}$

same as $\frac{dy}{dx}$ for $r = 1+\cos\theta$

$x = (1+\cos\theta)\cos\theta$

$y = (1+\cos\theta)\sin\theta$

$$\frac{\frac{dy}{d\theta} = -\sin^2\theta+\cos^2\theta+\cos\theta}{\frac{dx}{d\theta} = -2\sin\theta\cos\theta-\sin\theta} \Rightarrow \boxed{\frac{dy}{dx} = \frac{\cos\theta+\cos(2\theta)}{-\sin\theta-\sin(2\theta)}}$$

11-91 c) For any value of θ, the tangent slopes are the same for $r=1+\cos\theta$ & $r=a(1+\cos\theta)$

11-92 $r=1+\cos\theta$ $\quad r=5(1+\cos\theta)$

smaller area: ~~f~~ when does $1+\cos\theta=0$ ← cross pole

$\cos\theta=-1$

$\theta=\pi+2\pi k$

$\theta=\{\pi, 3\pi, 5\pi, \dots\}$

$$\int_0^{2\pi} \frac{1}{2}(1+\cos\theta)^2\, d\theta$$

calculator $\approx$ 4.712 ← smaller

larger area:

$$\int_0^{2\pi} \frac{1}{2}(5(1+\cos\theta))^2\, d\theta \approx 117.810 \leftarrow \text{larger.}$$

The ratio is 25 : 1

in general,

$r=a(1+\cos\theta)$ will have a^2 times as much area as $r=1+\cos\theta$

(This makes sense b/c the radii are @ an a:1 ratio.)

11-93 $r=e^{-\theta/10}$

a) $\theta=\pi/3$ ← crosses this ray at $r=e^{\pi/3/10}=e^{\pi/30}$

and $r=e^{7\pi/3/10}=e^{7\pi/30}$

and $r=e^{13\pi/3/10}=e^{13\pi/30}$

Continued... ⟶

11-93 a) $r = e^{\theta/10}$

$x = e^{\theta/10}\cos\theta$ $\quad$ $y = e^{\theta/10}\sin\theta$

$\frac{dx}{d\theta} = \frac{1}{10}e^{\theta/10}\cos\theta - e^{\theta/10}\sin\theta$ $\quad$ $\frac{dy}{d\theta} = \frac{1}{10}e^{\theta/10}\sin\theta + e^{\theta/10}\cos\theta$

$$\frac{dy}{dx} = \frac{e^{\theta/10}\left(\frac{1}{10}\sin\theta + \cos\theta\right)}{e^{\theta/10}\left(\frac{1}{10}\cos\theta - \sin\theta\right)}$$

$$\frac{dy}{dx} = \frac{\sin\theta + 10\cos\theta}{\cos\theta - 10\sin\theta}$$

when $\theta = \pi/3$ or any coterminal angle ...

$$\frac{dy}{dx} = \frac{\frac{\sqrt{3}}{2} + 5}{\frac{1}{2} - 5\sqrt{3}} = \frac{\sqrt{3}+10}{1-10\sqrt{3}} \approx -0.719$$

The slopes are the same for any point crossing $\theta = \pi/3$ (the ray)

b) THE SLOPES ~~ARE THE~~ SAME.
The derivative formula gives the same value for all coterminal sets of angles!

$\sin(\pi/3) = \sin(7\pi/3)$ etc...

REVIEW/PREVIEW

11-94 For $0 \le t \le 1$, position is $x(t) = \frac{1}{4}e^{8t} - 2t$ $\quad$ $y(t) = e^{4t}$

When $t = 1/4$, find velocity & speed:

velocity: $x'(t) = 2e^{8t} - 2$ $\quad$ $y'(t) = 4e^{4t}$

$x'(1/4) = 2e^2 - 2$ $\quad$ $y'(\frac{1}{4}) = 4e$

$\boxed{\text{Velocity: } \langle 2e^2 - 2,\ 4e \rangle}$

Speed: hypotenuse! $= \sqrt{(2e^2-2)^2 + (4e)^2}$

$= \sqrt{4e^4 - 8e^2 + 4 + 16e^2}$

$= \sqrt{(2e^2+2)^2}$

$= \boxed{2e^2+2}$

→

11-95 $x(t)=t^2-t \quad y(t)=\frac{1}{3}t^3-t$ on $0\le t\le 1$.

Find arclength.

$$\text{Arclength} = \int_0^1 \sqrt{(x'(t))^2+(y'(t))^2}\,dt$$

$$= \int_0^1 \sqrt{(2t-1)^2+(t^2-1)^2}\,dt$$

unnecessary → $= \int_0^1 \sqrt{4t^2-4t+1+t^4 \cancel{dt} -2t^2+1}\,dt$

Calculator $\boxed{\approx 0.903 \text{ units}}$

11-96 I) $\sum_{n=1}^{\infty} \frac{(-1)^n}{n+2}$ conv. by A.S.T.

II) $\sum_{n=1}^{\infty} n!\,e^{-n} = \sum_{n=1}^{\infty} \frac{n!}{e^n}$ div. by n^{th} term test $\boxed{A}$

III) $\sum_{n=1}^{\infty} \frac{3n}{(-1)^n}$ div. by n^{th} term test

11-97 a) $\int_{-1}^{1} x^{-1/3}\,dx$

$= \frac{3}{2}x^{2/3}\Big|_{-1}^{1}$

$= \frac{3}{2}-\frac{3}{2}$

$= \boxed{0}$

b) $\int \cos x\, e^{\sin x}\,dx$

$u=\sin x \quad du=\cos x\,dx$

$= \int e^u\,du$

$= e^u + C$

$= \boxed{e^{\sin x}+C}$

c) $\int_{-6}^{6} \sin(x^3)\,dx$ ← This is gross, but at least I know that $\sin(x^3)$ is odd, which means that $\int_{-a}^{a}\sin(x^3)\,dx = \underline{\underline{0}}$

11-97 d) $\int \frac{\cos x}{\sin x}\,dx$ $u = \sin x$ $du = \cos x\,dx$

$= \int \frac{du}{u}$

$= \ln|u| + c$

$= \boxed{\ln|\sin x| + c}$

11-98

Time	9a	11a	12p	1p	2p	4p	5p	7p
H burgs	3	39	81	251	341	498	611	894

a) @ 10 am, $\frac{dH}{dt} \approx \frac{39-3}{11-9} = \frac{36}{2} = $ 18 hamburgers/hr

b) from 12pm to 1pm, the rate was biggest.

11-99 $\frac{dP}{dt} = \frac{1}{160} P(40-P)$ ← logistic! lions! per year!

$t=0 \ldots$ $P(0) = 12$. Find $P(3)$.

$\int \frac{dP}{P(40-P)} = \int \frac{dt}{160}$

$\frac{1}{40}\int \frac{dP}{P} - \frac{1}{40}\int \frac{dP}{40-P} = \int \frac{dt}{160}$

$4\ln|P| - 4\ln|40-P| = t + C$, $P(0) = 12$

$4\ln\left|\frac{12}{40-12}\right| = 0 + C$

$C = 4\ln\left|\frac{12}{28}\right|$

when $t=3 \ldots$ $4\ln\left|\frac{P}{40-P}\right| = 3 + 4\ln\left|\frac{12}{28}\right|$

$\ln\left|\frac{P}{40-P}\right| = \frac{3}{4} + \ln\left|\frac{12}{28}\right|$

$\left|\frac{P}{40-P}\right| = e^{3/4}\cdot\left(\frac{12}{28}\right)$

$P = 40\left(\frac{12}{28}\right)e^{3/4} - P\left(\frac{12}{28}\right)e^{3/4}$

$P = \frac{40\left(\frac{12}{28}\right)e^{3/4}}{1 + \left(\frac{12}{28}\right)e^{3/4}}$

$P \approx 19.028$

$\boxed{\text{19 lions!}}$

11-100 $f(x) = x - \frac{x^3}{6} + \frac{x^5}{120} - \frac{x^7}{5040} + \frac{x^9}{362880} - \dots$ near $x=0$

$= \frac{x^1}{1!} - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \frac{x^9}{9!} + \dots$

$= \sin x$

$\boxed{C}$

11-101 $\sum_{n=1}^{\infty} \frac{(x-1)^n}{n!}$

$\rho = \lim_{n\to\infty} \left| \frac{(x-1)^{n+1}}{(n+1)!} \cdot \frac{n!}{(x-1)^n} \right|$

$= \lim_{n\to\infty} \left| \frac{x-1}{n+1} \right|$

$= 0 < 1$ always

$\boxed{(-\infty, \infty)}$

11-102 M = avg value of $f(x) = 3 \cdot 2^{x-1}$ on $0 \le x \le 5$.

When (for what value $x=c$) does $f(c) = M$?

M.V.T. for Integrals

Avg value $= \left[\int_0^5 3 \cdot 2^{x-1}\, dx\right] \frac{1}{5}$

$= \left[3 \cdot 2^{x-1} \frac{1}{\ln 2} \Big|_0^5 \right] \frac{1}{5}$

$= \left[3 \cdot 2^4 \frac{1}{\ln 2} - 3 \cdot 2^{-1} \frac{1}{\ln 2}\right] \frac{1}{5}$

$3 \cdot 2^{c-1} = \left[3 \cdot 2^4 \frac{1}{\ln 2} - 3 \cdot 2^{-1} \frac{1}{\ln 2}\right] \frac{1}{5}$

$2^{c-1} = \frac{1}{5 \ln 2}(2^4 - 2^{-1})$

~~$c-1 = \log_2(5\ln 2) + \log_2(2^4 - 2^{-1})$~~

Solve by graphing...

$c = 3.161$ $\boxed{B}$