

CAD Practical Midterm Exam 20%

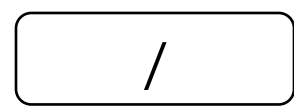
Fall 2021

Time: 45 minutes

..... الاسم: رقم القيد: المجموعة:

Q: (10 Marks) Solve the following Mathematical expressions using MATLAB:

Mathematical Expression	MATLAB Code
$\frac{d^2}{dt^2} \frac{\sqrt{2x^2 - t}}{2x^2 - t}$	<pre>>> syms t x, diff(sqrt(2*x^2-t)/(2*x^2-t),t,2) ans = 3/(4*(2*x^2 - t)^(5/2))</pre>
$\int \frac{x+1}{(x+2)^4} dx$	<pre>>> syms x, int((x+1)/(x+2)^4) ans = -(3*x + 4)/(6*(x + 2)^3)</pre>
$\frac{1}{\sqrt{2}} \int_0^{\pi} t \cos\left(t + \frac{\pi}{2}\right) dt$	<pre>>> syms t 1/sqrt(2) * int(t * cos(t + pi/2),0 , pi) ans = -(pi*2^(1/2))/2</pre>
<p>if $a = 20$, and</p> $V(r) = \frac{4}{3}\pi r^3$ <p>$\therefore \lim_{r \rightarrow a} \frac{V(r)-f(a)}{r-a}$</p>	<pre>>> syms r; a = 20; V = @(r) 4/3*pi*r^3; limit((V(r)-V(a))/(r-a) , r, a) ans = 1600*pi</pre>
$s = 1 - \frac{1}{2!} + \frac{1}{3!} \dots + \frac{1}{99!} - \frac{1}{100!}$	<pre>>> n = 1:2:100; S = sum(1./factorial(n)-1./factorial(n+1)) s = 0.6321</pre>



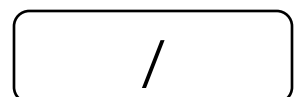
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$g = \prod_{k=0}^4 (1 + x^{2^k})$	<pre>>> k = 0:4; syms x; >> prod(1 + (x.^(2.^k))) ans = (x^2 + 1)*(x^4 + 1)*(x^8 + 1)*(x^16 + 1)*(x + 1)</pre>
$\mathcal{F}\{e^{-a t }\}$	<pre>>> syms a t w; fourier(exp(-a*abs(t)) , t, w) ans = (2*a)/(a^2 + w^2)</pre>
$\mathcal{F}^{-1}\{2\pi\delta(w - 10)\}$	<pre>>> syms t w; ifourier(2*pi*dirac(w-10) , w, t) ans = exp(t*10i)</pre>
$\mathcal{L}\{e^{at}\cos(bt)\}$	<pre>>> syms t s a b; laplace(exp(a*t)*cos(b*t), t, s) ans = -(a - s)/(b^2 + (a - s)^2)</pre>
$\mathcal{L}^{-1}\left\{\frac{1}{s^2 - a^2}\right\}$	<pre>>> syms t s a; ilaplace(1/(s^2-a^2), s, t) ans = exp(a*t)/(2*a) - exp(-a*t)/(2*a)</pre>



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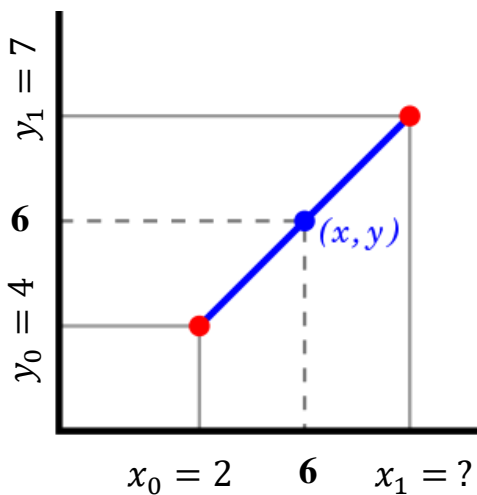
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Q: (2 Marks) Rewrite the following MATLAB code to get the corresponding output:

MATLAB Script	Evaluation Output
<pre>for i = 1:7 for j = 1:i fprintf('%d', j) end fprintf('\n') end</pre>	<pre>1 12 123 1234 12345 123456 1234567</pre>
<pre>x = ['a' 'b' 'c' 'd' 'e' 'f' 'g']; for i=7:-1:1 for j= 1:i fprintf('%s', x(j)) end fprintf('\n') end</pre>	<pre>a b a c b a d c b a e d c b a f e d c b a g f e d c b a</pre>

Q: (3 Marks) Create a MATLAB function and use it to get the **unknown** in the graph:

$$\frac{y - y_0}{x - x_0} = \frac{y_1 - y_0}{x_1 - x_0},$$



```
>> syms x0 y0 x y x1 y1

>> x1 = @(x0,y0,x,y,y1) (y1-y0)*(x-x0)/(y-y0) + x0

x1 =

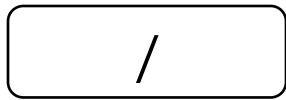
function_handle with value:

@(x0,y0,x,y,y1) (y1-y0)*(x-x0)/(y-y0)+x0

>> x1(2,4,6,6,7)

ans =

8
```



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Q: (5 Marks) Solve the following Algebraic Equations using MATLAB, **your answer must be in fractional form:**

$$\begin{array}{l} 2x - 2z = 3 - y \\ -y - z + x = 0 \\ x + y = 12 - 3z \end{array} \quad \rightarrow \quad \begin{array}{l} 2x + y - 2z = 3 \\ x - y - z = 0 \\ x + y + 3z = 12 \end{array}$$

```
>> A = [2 1 -2; 1 -1 -1; 1 1 3]; b = [ 3; 0 ; 12];  
>> sym(linsolve(A,b))  
ans =  
7/2  
1  
5/2
```

$$\ln(x - 2) + \ln(2x - 3) = 2\ln x + 2$$

```
>> syms x  
>> solve( log(x-2) + log(2*x-3) - 2*log(x) - 2 )  
ans =  
-1/((24*exp(2) + 1)^(1/2)/12 - 7/12)
```

Best of luck