% Solutions to Exercises in Chapter 1
% *An Engineer's Guide to MATLAB*, 2nd ed.

% Exercise 1.1

```
r=2.5;
I=(pi/8-8/9/pi)*r^4
```

Answers

```
I =
   4.2874
```

% Exercise 1.2

```
c=5;
K=(4*c-1)/(4*c+4)+0.615/c
```

Answers

```
K =
   0.9147
```

% Exercise 1.3

```
B=0.6;
K=3/(1-B)^3*(0.5-2*B+B*(1.5-log(B)))
```

Answers

```
K =
  23.7420
```

% Exercise 1.4

```
R=30;  r=12;  S=50;
theta=asin((R-r)/S);
L=2*S*cos(theta)+pi*(R+r)+2*theta*(R-r)
```

Answers

```
L =
```

```
  238.4998
```

% Exercise 1.5

```
Fn=250;  f=0.35;  r=0.4;  theta=60*pi/180;
T=(4*f*r*Fn*sin(theta/2))/(theta+sin(theta))
```

Answers

```
T =
   36.5875
```

% Exercise 1.6

```
A=1.7;  B=1.2;
D=1.265*((A*B)^3/(A+B))^(1/5)
```

Answers

```
D =
    1.5682
```

% Exercise 1.7

```
n=6;
M=1/sin(pi/n);
C=(1+M^2)/4/M;
alpha=acos(sqrt(C^2+2)-C);
aG=M*(1-M^2)*sin(alpha)/(1+M^2-2*M*cos(alpha))^2
```

Answers

```
aG =
   -1.3496
```

% Exercise 1.8

```
L=3000;  d=45;  V=1600;
Deltap=0.03*L/d^1.24*(V/1000)^1.84
```

```
Deltap =
    1.9048
```

% Exercise 1.9

```
E1=3e7;  E2=3e7;
nu1=0.3; nu2= 0.3;
d1=1.5;  d2=2.75;
F=100;  z=0.01;
a=(0.375*F*((1-nu1^2)/E1+(1-nu2^2)/E2)/(1/d1+1/d2))^(1/3)
pmax=1.5*F/pi/a^2
za=z/a
sxsy=-pmax*((1-za*atan(1/za))*(1-nu1)-0.5/(1+za^2))
sz=-pmax/(1+za^2)
```

Answers

```
a =
    0.0130
pmax =
  2.8158e+005
za =
    0.7679
sxsy =
 3.0093e+004
sz =
 -1.7712e+005
```

% Exercise 1.10

```
E1=3e7;  E2=3e7;
nu1=0.3;  nu2= 0.3;
d1=1.5;  d2=2.75;
F=100;  z=0.001;  L=2;
b=sqrt(2*F/pi/L*((1-nu1^2)/E1+(1-nu2^2)/E2 )/(1/d1+1/d2))
pmax=2*F/pi/b/L
zb=z/b
sx=-pmax*2*nu2*(sqrt(1+zb^2)-zb)
sy=-pmax*((2-1/(1+zb^2))*sqrt(1+zb^2)-2*zb)
sz=-pmax/sqrt((1+zb^2))
```

Answers

```
b =
```

```
    0.0014
pmax =
  2.3251e+004
zb =
    0.7304
sx =
 -7.0857e+003
sy =
 -4.8438e+003
sz =
 -1.8775e+004
```

% Exercise 1.11

```
e=0.8;
NL=pi*e*sqrt(pi^2*(1-e^2)+16*e^2)/(1-e^2)^2
```

Answers

```
NL =
   72.0220
```

% Exercise 1.12

```
h=1.25;  d0=0.25;
d1=0.625;  E=3e7;
d2=d1+h*tan(pi/6)
k=pi*E*d0*tan(pi/6)/log((d2-d0)*(d1+d0)/(d2+d0)/(d1-d0))
```

Answers

```
d2 =
    1.3467
k =
  2.8842e+007
```

% Exercise 1.13

```
alpha=1.2e-5;  E=3e7;  nu=0.3;
Ta=500;  Tb=300;  a=0.25;  b=0.5;  r=0.375;
c1=alpha*E*(Ta-Tb)/2/(1-nu)/log(b/a)
c2=a^2/(b^2-a^2)*log(b/a)
sr=c1*(c2*(b^2/r^2-1)-log(b/r))
st=c1*(1-c2*(b^2/r^2+1)-log(b/r))
T=Tb+(Ta-Tb)*log(b/r)/log(b/a)
```

Answers

```
c1 =
  7.4196e+004
c2 =
    0.2310
sr =
 -8.0115e+003
st =
  5.2319e+003
t =
  383.0075
```

% Exercise 1.14

```
k=1.4;  pepo=0.3;
psi=sqrt(k/(k-1))*sqrt(pepo^(2/k)-pepo^((k+1)/k))
```

Answers

```
psi =
    0.4271
```

% Exercise 1.15

```
x=0.45;
K=1.2/x/(sqrt(16*x^2+1)+log(sqrt(16*x^2+1)+4*x)/4/x)^(2/3)
```

Answers

```
k =
    1.3394
```

% Exercise 1.16

```
c=sqrt(8)/9801;
n=0;
oneopi0=c*(1103+26390*n)*gamma(4*n+1)/gamma(n+1)^4/396^(4*n);
n=1;
oneopi1=c*(1103+26390*n)*gamma(4*n+1)/gamma(n+1)^4/396^(4*n);
format long e
pin0=1/oneopi0
diffpino=pin0-pi
pin0n1=1/(oneopi0+oneopi1)
```

```
diffpin0n1= pin0n1-pi
format short
```

Answers

```
pin0 =
   3.141592730013306e+000
diffpino =
   7.642351240733092e-008
pin0n1 =
   3.141592653589794e+000
diffpin0n1 =
   4.440892098500626e-016
```

% Exercise 1.17

```
r = 10;  rc = 3;  k = 1.4;
eta = 1-1/r^(k-1)*((rc^k-1)/k/(rc-1))
```

Answers

```
eta =
   0.4803
```

% Exercise 1.18

```
M = 2;  k = 1.4;
AA = 1/M*(2/(k+1)*(1+(k-1)/2*M^2))^((k+1)/(2*(k-1)))
```

Answers

```
AA =
   1.6875
```