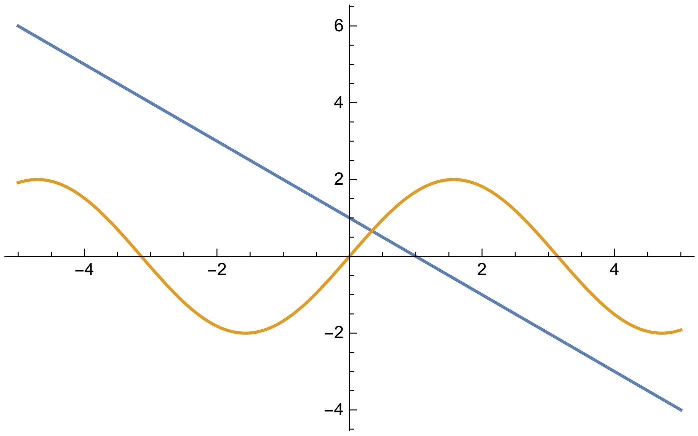
W5 P1a

In[1]:=
```
Plot[{1 - x, 2 Sin[x]}, {x, -5, 5}]
```

Out[1]=



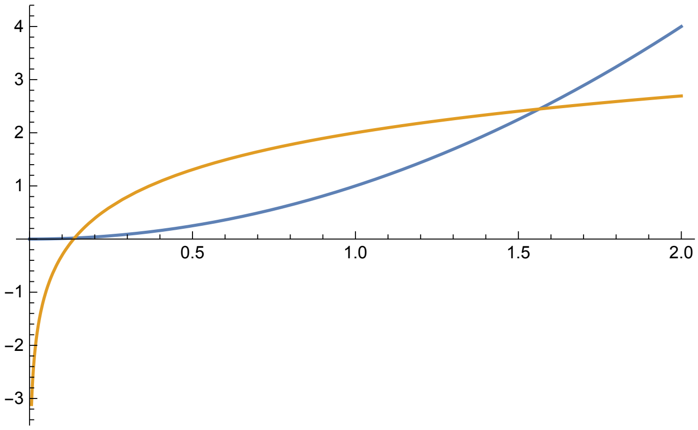
In[2]:=
```
NSolve[1 - x == 2 Sin[x], x, Reals]
```

Out[2]= {{x → 0.337584}}

W5 P1b

In[3]:=
```
Plot[{x^2, 2 + Log[x]}, {x, 0, 2}]
```

Out[3]=



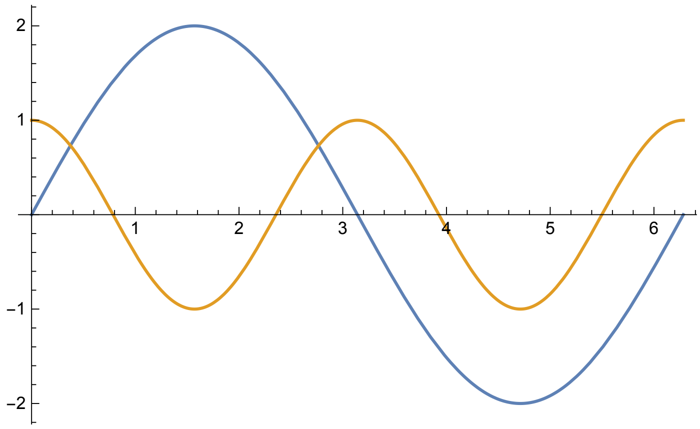
In[4]:=
```
NSolve[x^2 == 2 + Log[x], x, Reals]
```

Out[4]= {{x → 0.137935}, {x → 1.56446}}

W5 P1c

In[5]:= `Plot[{2 Sin[x], Cos[2 x]}, {x, 0, 2 π}]`

Out[5]=



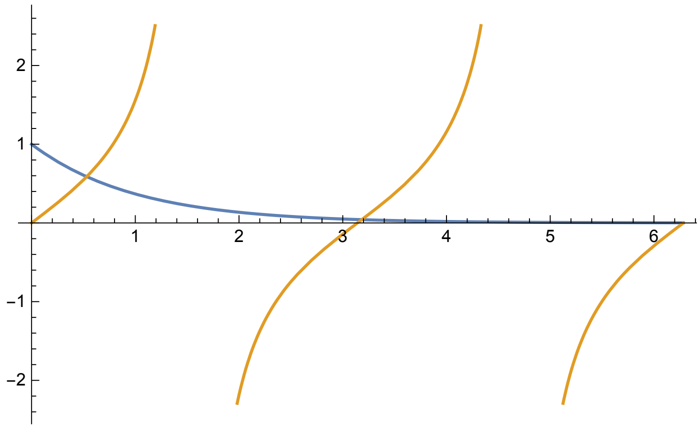
In[6]:= `NSolve[2 Sin[x] == Cos[2 x] && x ≥ 0 && x < 2 π, x, Reals]`

Out[6]= `{{x → 0.374734}, {x → 2.76686}}`

W5 P1d

In[7]:= `Plot[{Exp[-x], Tan[x]}, {x, 0, 2 π}]`

Out[7]=



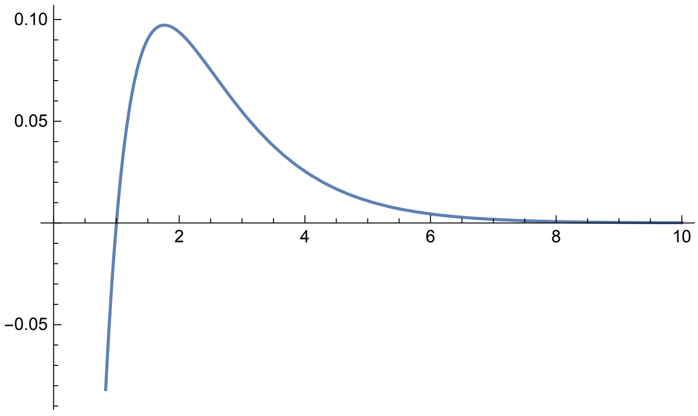
In[8]:= `NSolve[Exp[-x] == Tan[x] && x ≥ 0 && x < 2 π, x, Reals]`

Out[8]= `{{x → 0.531391}, {x → 3.18303}}`

W5 P2a

In[9]:=
```
Plot[Exp[-x] Log[x], {x, 0, 10}]
```

Out[9]=



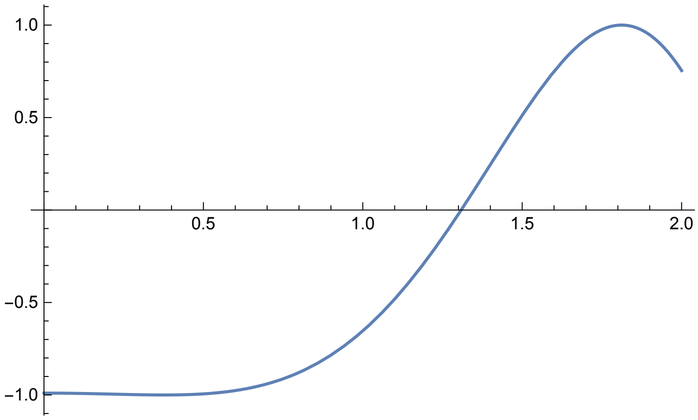
In[10]:=
```
NMaximize[{Exp[-x] Log[x], x > 0}, x]
```

Out[10]= {0.0972601, {x → 1.76322}}

W5 P2b

In[11]:=
```
Plot[Cos[x^2 + 3], {x, 0, 2}]
```

Out[11]=



In[12]:=
```
NMaximize[{Cos[x^2 + 3], x > 0, x < 2}, x]
```

Out[12]= {1., {x → 1.81196}}

In[13]:=
```
NMinimize[{Cos[x^2 + 3], x > 0, x < 2}, x]
```

Out[13]= {-1., {x → 0.376288}}

W5 P3

In[14]:=
```
y[x_] := 2 x;
y'[x] dx
```

Out[15]= 2 dx

In[16]:=
```
y[x_] := 3 x^2 + 2 x + 1;
y'[x] dx
```
Out[17]= $dx\,(2 + 6\,x)$

In[18]:=
```
y[x_] := Sin[x];
y'[x] dx
```
Out[19]= dx Cos[x]

W5 P4

In[20]:=
```
V[r_] := 4/3 π r^3;
V'[r] dr
```
Out[21]= $4\,dr\,\pi\,r^2$

W5 P5

In[22]:=
```
f[x_, y_] := x^2 + y^2;
D[f[x, y], x] dx + D[f[x, y], y] dy
```
Out[23]= $2\,dx\,x + 2\,dy\,y$

In[24]:=
```
f[x_, y_] := 3 x^2 + Sin[x - y];
D[f[x, y], x] dx + D[f[x, y], y] dy
```
Out[25]= −dy Cos[x − y] + dx (6 x + Cos[x − y])

In[26]:=
```
f[x_, y_] := 3 x^3 y^2 + Log[y];
D[f[x, y], x] dx + D[f[x, y], y] dy
```
Out[27]= $9\,dx\,x^2\,y^2 + dy\left(\frac{1}{y} + 6\,x^3\,y\right)$

In[28]:=
```
f[r_, θ_, φ_] := r Sin[θ] Sin[φ];
D[f[r, θ, φ], r] dr + D[f[r, θ, φ], θ] dθ + D[f[r, θ, φ], φ] dφ
```
Out[29]= dφ r Cos[φ] Sin[θ] + dθ r Cos[θ] Sin[φ] + dr Sin[θ] Sin[φ]

W5 P6

In[30]:=
```
D[4 x + 3 y, y] == D[3 x + 8 y, x]
```
Out[30]= True

In[31]:=
```
D[y Cos[x], y] == D[Sin[x], x]
```
Out[31]= True

W5 P7 - follows from the fact that mixed second derivatives of G must be equal.