2.7 worksheet solutions

1a

In[•]:=
```
f[x_] := Sin[3 x] Exp[x^3]
f'[x]
```

Out[•]=
$$3\, e^{x^3} \cos[3x] + 3\, e^{x^3} x^2 \sin[3x]$$

1b

In[135]:=
```
f[x_] := Tan[2 x + 3] Exp[3 x]
f'[x]
```

Out[136]=
$$2\, e^{3x} \sec[3 + 2x]^2 + 3\, e^{3x} \tan[3 + 2x]$$

1c

In[137]:=
```
f[x_] := Sqrt[2 x + 1] / Cos[2 x]
f'[x]
```

Out[138]=
$$\frac{\sec[2x]}{\sqrt{1 + 2x}} + 2\sqrt{1 + 2x}\, \sec[2x] \tan[2x]$$

2a

In[139]:=
```
Solve[D[x^2 y[x]^2, x] == D[x + 2, x], y'[x]]
```

Out[139]=
$$\left\{\left\{y'[x] \to \frac{1 - 2x\, y[x]^2}{2x^2\, y[x]}\right\}\right\}$$

2b

In[140]:=
```
Solve[D[Sin[x y[x]], x] == D[x + y[x], x], y'[x]]
```

Out[140]=
$$\left\{\left\{y'[x] \to \frac{1 - \cos[x\, y[x]]\, y[x]}{-1 + x \cos[x\, y[x]]}\right\}\right\}$$

3

In[142]:=
```
D[1 / y[x], x]
```

Out[142]=
$$-\frac{y'[x]}{y[x]^2}$$

4a

In[165]:=
```
a = -3
b = 3
Solve[D[x^3 - y[x]^3, x] == D[6 x y[x], x], y'[x]]
m = (a^2 - 2 b)/(2 a + b^2)
b + m (x - a)
```

Out[165]= -3

Out[166]= 3

Out[167]= $\left\{\left\{y'[x] \to \frac{x^2 - 2\,y[x]}{2\,x + y[x]^2}\right\}\right\}$

Out[168]= 1

Out[169]= $6 + x$

4b

In[160]:=
```
a = 0
b = 0
Solve[D[Sin[y[x]] + y[x], x] == D[x^3 + x, x], y'[x]]
m = (1 + 3 a^2)/(1 + Cos[b])
b + m (x - a)
```

Out[160]= 0

Out[161]= 0

Out[162]= $\left\{\left\{y'[x] \to \frac{1 + 3\,x^2}{1 + \text{Cos}[y[x]]}\right\}\right\}$

Out[163]= $\frac{1}{2}$

Out[164]= $\frac{x}{2}$

In[•]:=
```
-(3 (-1 + a b))/(3 a^2 + 2 ℯ^(a b) b)
```

Out[•]= 0.23495

4a

In[170]:=
```
a = .619061
b = 1
Solve[D[3 x Exp[-x y[x]], x] == D[y[x]^2, x], y'[x]]
m = -(3 (-1 + a b)) / (3 a^2 + 2 e^(a b) b)
b + m (x - a)
```

Out[170]= 0.619061

Out[171]= 1

Out[172]= $\left\{\left\{y'[x] \to -\frac{3\,(-1+x\,y[x])}{3\,x^2+2\,e^{x\,y[x]}\,y[x]}\right\}\right\}$

Out[173]= 0.23495

Out[174]= $1 + 0.23495\,(-0.619061 + x)$

Out[•]= 0.23495