

math165_ex_2_3_48.mw

Maple 9.5 Worksheet for Problems in Math 165 - Calculus for Business.

First load plots and student:

```
> restart:with( student):with (plots):
```

Chapter 2 Section 2.3 Problem 48 p. 136 DEMAND AND REVENUE

The manager of a company that produce graphing calculators determines that when x thousand calculators ar produced, they will be sold when the price is

$$p(x) = 1,000/(0.3 x^2 + 8)$$

dollars per calculator.

(a) At what rate is demand [price?] $p(x)$ changing with respect to the level of production x when 3,000 ($x = 3$) calculators are produced?

(b) The revenue derived from the sale of x thousand calculators is

$$R(x) = x p(x)$$

To answer (a), evaluate dp/dx when $x = 3$.

To answer (b) calculate $dR/dx = 1 p(x) + x dp/dx$ when $x = 3$.

```
> p:= proc(x) description`price at production (demand) x thousand`;
> 1000/(0.3* x^2 + 8):
> end proc; p(x);
```

```
p := proc(x)
```

```
description`price at production (demand) x thousand`;
```

```
1000/(0.3 * x^2 + 8)
```

```
end proc
```

$$\frac{1000}{0.3 x^2 + 8}$$

```
> R:= proc(x) description`Revenue at at price x`;
```

```
> x*p(x):
```

```
> end proc;R(x);
```

```
>
```

```
R := proc(x) description`Revenue at at price x`; x*p(x) end proc
```

$$\frac{1000 x}{0.3 x^2 + 8}$$

To answer (a), calculate the derivative dp/dx

```
> p_prime:=proc(x) description`derivarive of p(x) wrt x`;
```

```
> diff(p(x), x):
```

```
> end proc; p_prime(x);
  p_prime := proc(x) description `derivative of p(x) wrt x`; diff(p(x), x) end proc
```

$$\frac{600.0 x}{(0.3 x^2 + 8)^2}$$

Evaluate at x=3:

```
eval([p(x), p_prime(x)], x=3);
cat("At x =3, P =", convert(%[1], string), " and p_prime = ", convert(%
[2], string));
```

```
[93.45794393, -15.72189711]
```

```
"At x =3, P =93.45794393 and p_prime = -15.72189711"
```

To answer (b). calculate dR/dx.

```
> R_prime := proc(x) description `derivative of R(x)` :
```

```
> diff(R(x), x) :
```

```
> end proc; R_prime(x); normal(R_prime(x));
```

```
R_prime := proc(x) description `derivative of R(x)`; diff(R(x), x) end proc
```

$$\frac{1000}{0.3 x^2 + 8} - \frac{600.0 x^2}{(0.3 x^2 + 8)^2}$$

$$\frac{300.0 x^2 - 8000.}{(0.3 x^2 + 8)^2}$$

```
> eval([R(x), R_prime(x)], x=3);
```

```
[280.3738318, 46.29225261]
```

Conclude that producing 100 more calculators (lower the price!) will give a revenue increase of approximately 4.6 thousand dollars -- even though the price is being reduced by approximately 1,6 dollars. Note that the price at a production level of 3,000 is 93.46 or `eval(p(x), x=3)`; To verify this

```
> eval([R(x), p(x)], x=3.1);
```

```
93.45794393
```

```
[284.8479280, 91.88642837]
```

```
>
```