1) A company makes a single product. The cost function for the pro duct is given by:

$C(x) = x^2 + 5x + 75$
where is the $C(x)$ is the total cost to produce x units of the product.
The demand function is given by,

$p(x) = -3x + 85$

where p (x) is the price to sell x units of the product.
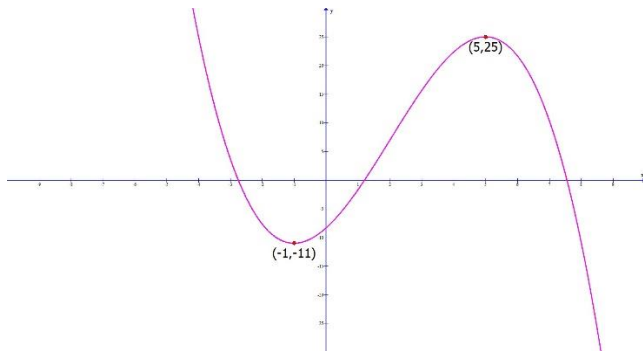
a) Create a revenue function.
b) Create a profit function.
c) How many units must the company produce and sell to maximize profit?
d) What is the maximum profit?
e) What price per unit must be charged to make maximum profit?

2) $f(x) = 2x^3 - 18x^2$

a) Find $f''(x)$

b) Find the critical numbers for $f''(x)$

c) Find the interval where the graph of f (x) is concave up

d) Find the interval where the graph of f (x) is concave down

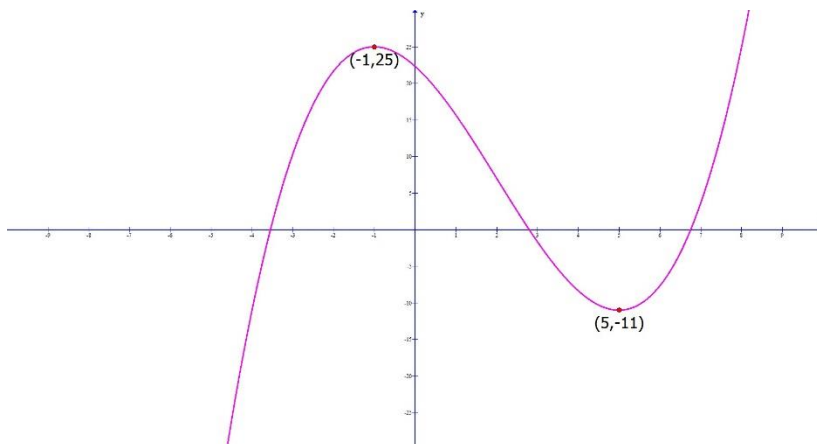e) Find the coordinates of the inflection point to the graph of

3) The graph of f(x) is given below.
Find the following:

a) interval(s) where the graph is increasing.
b) interval(s) where the graph is decreasing.
c) the coordinates of relative maximum point if any
d) the relative maximum value
e) the coordinates of the relative minimum point if any
f) the relative minimum value

4) The graph of f(x) is given below.
Find the following:

a) interval(s) where the graph is increasing.
b) interval(s) where the graph is decreasing.
c) the coordinates of relative maximum point if any
d) the relative maximum value
e) the coordinates of the relative minimum point if any
f) the relative minimum value

5) Let $f(x) = 8xe^x$

Find the following:

a) $f'(x)$

b) The critical numbers for $f'(x)$

c) The interval where the graph of $f(x)$ is increasing.

d) The interval where the graph of $f(x)$ is decreasing.

e) The coordinate of the relative maximum point, if any.

f) The relative maximum value.

g) The coordinate of the relative minimum point, if any.

h) The relative minimum value.

6) Let $f(x) = x^3 - 48x$

Find the following:

a) Find the x-intercept(s), if any
b) Find the y-intercept, in there is one
c) Find the interval(s) where the graph of the function is increasing
d) Find the interval(s) where the graph of the function is decreasing
e) Find all relative maxima (just write as a point)
f) Find all relative minima (just write as a point)
g) Find the interval(s) where the graph of the function is concave up (if any)
h) Find the interval(s) where the graph of the function is concave down (if any)
i) Find all inflection points (if any)
j) Sketch a graph

7) Let $f(x) = \dfrac{2x+8}{x-4}$

The necessary derivatives will be provided.

$$f'(x) = -\frac{16}{(x-4)^2} \qquad f''(x) = \frac{32}{(x-4)^3}$$

a) Find the domain
b) Find the equation of the vertical asymptote
c) Find the x-intercept(s), if any
d) Find the y-intercept, in there is one
e) Find all horizontal asymptotes
f) Find the interval(s) where the graph of the function is increasing
g) Find the interval(s) where the graph of the function is decreasing
h) Find all relative maxima
i) Find all relative minima
j) Find the interval(s) where the graph of the function is concave up (if any)
k) Find the interval(s) where the graph of the function is concave down (if any)
l) Find all inflection points (if any)
m) Sketch a graph

Answers:

1a) $R(x) = -3x^2 + 85x$ 1b) $P(x) = -4x^2 + 80x - 75$ 1c) $10\ units$

1d) \$325   1e) \$55

2a) $f''(x) = 12x - 36$ 2b) $x = 3$ 2c) $(3, \infty)$ 2d) $(-\infty, 3)$ 2e) $(3, -108)$

3a) $(-1,5)$ 3b) $(-\infty, -1) \cup (5, \infty)$

3c) $(5,25)$ 3d) $y = 25\ which\ occurs\ when\ x = 5$

3e) $(-1, -11)$ 3f) $y = -11\ which\ occurs\ when\ x = -1$

4a) $(-\infty, -1) \cup (5, \infty)$ 4b) $(-1,5)$

4c) $(-1,25)$ 4d) $y = 25\ which\ occurs\ when\ x = -1$

4e) $(5, -11)$ 4f) $y = -11\ which\ occurs\ when\ x = 5$

5a) $f'(x) = 8e^x(x + 1)$ 5b) $x = -1$

5c) $(-1, \infty)$ 5d) $(-\infty, -1)$

5e) none   5f) none

5g) $(-1. -\frac{8}{e})$ 5h) $y = -\frac{8}{e}\ which\ occurs\ when\ x = -1$

6a) $(0,0)$ $(-4\sqrt{3},0)(4\sqrt{3},0)$ 6b) $(0,0)$ 6c) $(-\infty,4)\cup(4,\infty)$
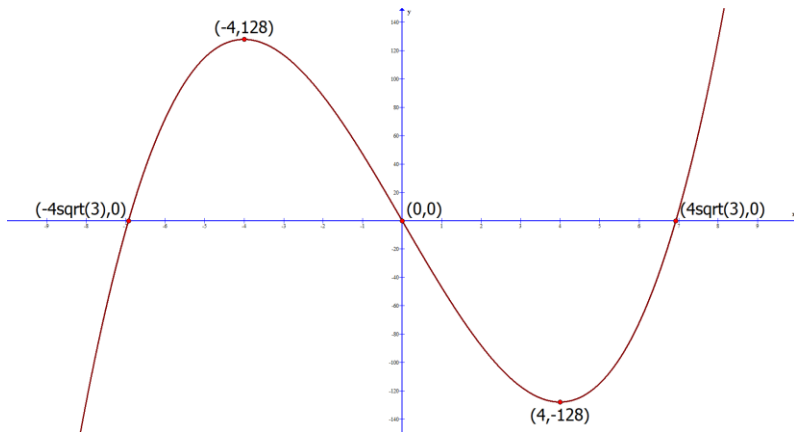
6d) $(-4,4)$ 6e) $(-4,128)$ 6f) $(4,-128)$

6g) $(0,\infty)$ 6h) $(-\infty,0)$ 6i) $(0,0)$

6j)

7a) $(-\infty,4)\cup(4,\infty)$ 7b) $x=4$ 7c) $(-4,0)$ 7d) $(0,-2)$

7e) $y=2$ 7f) $never$ 7g) $(-\infty,4)\cup(4,\infty)$

7h) none 7i) none 7j) $(4,\infty)$

7k) $(-\infty,4)$ 7l) none

7m)