

Courtesy of Nick I from thestudentforum

1.

$$\begin{aligned}\int (6x^2 + 2 + x^{-\frac{1}{2}}) dx \\ &= \frac{6x^3}{3} + 2x + 2x^{\frac{1}{2}} + c \\ &= 2x^3 + 2x + 2x^{\frac{1}{2}} + c\end{aligned}$$

2.

$$\begin{aligned}x^2 - 7x - 18 > 0 \\ (x-9)(x+2) > 0 \\ x < -2, x > 9\end{aligned}$$

3.

(a) Parabola resting on  $x=-3$ , crosses  $y$  axis at  $(0,9)$

(b) Parabola with no roots, crosses  $y$  at  $(0,9+k)$

4.

(a)  $a_1 = 3$

$$a_{n+1} = 3a_n - 5$$

$$a_2 = 4$$

$$a_3 = 7$$

(b)  $a_4 = 16$

$$a_5 = 43$$

$$\sum a_1 + a_2 + a_3 + a_4 + a_5 = 73$$

5.

(a)  $\frac{d}{dx}(x^4 + 6\sqrt{x})$

$$= \frac{d}{dx}(x^4 + 6x^{\frac{1}{2}})$$

$$= 4x^3 + 3x^{-\frac{1}{2}}$$

(b)  $\frac{d}{dx}\left(\frac{(x+4)^2}{x}\right)$

$$\begin{aligned}
&= \frac{d}{dx} \left( \frac{x^2 + 8x + 16}{x} \right) \\
&= \frac{d}{dx} \left( x + 8 + \frac{16}{x} \right) \\
&= \frac{d}{dx} (x + 8 + 16x^{-1}) \\
&= 1 - 16x^{-2}
\end{aligned}$$

6.

$$\begin{aligned}
\text{(a)} \quad &(4 + \sqrt{3})(4 - \sqrt{3}) \\
&= 16 + 4\sqrt{3} - 4\sqrt{3} - 3 \\
&= 13
\end{aligned}$$

$$\begin{aligned}
\text{(b)} \quad &\frac{26}{4 + \sqrt{3}} \\
&= \frac{(26)(4 - \sqrt{3})}{(4 + \sqrt{3})(4 - \sqrt{3})} \\
&= \frac{(26)(4 - \sqrt{3})}{13} \\
&= 2(4 - \sqrt{3}) \\
&= 8 - 2\sqrt{3}
\end{aligned}$$

$$\begin{aligned}
7. \quad &U_1 = 9 \\
&S_1 = 77 \\
77 &= \frac{11}{2}(2a + 10d) \\
9 &= a + 10d \\
a &= 5 \\
d &= \frac{2}{5}
\end{aligned}$$

8.

$$\begin{aligned}
\text{(a)} \quad &x^2 + 2px + (3p + 4) = 0 \\
&b^2 - 4ac = 0 \\
(2p)^2 - 4(3p + 4) &= 0 \\
4p^2 - 12p + 16 &= 0 \\
p^2 - 3p + 4 &= 0 \\
(p - 4)(p + 1) &
\end{aligned}$$

$$p=4$$

(b)

$$x^2 + 8x + 16 = 0$$

$$(x+4)(x+4)$$

$$x = -4$$

9.

(a)

$$(x^2 - 6x)(x - 2) + 3x$$

$$= x^3 - 8x^2 + 15x$$

$$= x(x^2 - 8x + 15)$$

(b)

$$x(x-5)(x-3)$$

(c) Cubic graph crossing x axis at 0, 3 and 5.

10.

(a)

$$\frac{d}{dx} = 2x + \frac{3}{x^2}$$

$$f(x) = \int (2x + \frac{3}{x^2}) dx$$

$$f(x) = x^2 - 3x^{-1} + c$$

$$(3, \frac{15}{2})$$

$$\frac{15}{2} = 8 + c$$

$$c = -\frac{1}{2}$$

$$f(x) = x^2 - 3x^{-1} - \frac{1}{2}$$

(b)

$$f(-2) = 4 + \frac{3}{2} - \frac{1}{2} = 5$$

(c)

$$\frac{d}{dx} = 2x + \frac{3}{x^2}$$

$$x = -2$$

$$\frac{d}{dx} = -4 + \frac{3}{4}$$

$$\frac{d}{dx} = -\frac{13}{4}$$

$$y = -\frac{13}{4}x + c$$

$$(-2, 5)$$

$$5 = \frac{13}{2} + c$$

$$c = \frac{3}{2}$$

$$y = -\frac{13}{4}x + \frac{3}{2}$$

$$4y = -13x + 6$$

$$13x + 4y - 6 = 0$$

11.

(a)

$$P(-1, 2) Q(11, 8)$$

$$\Delta y = 6 \quad \Delta x = 12$$

$$y = \frac{1}{2}x + c$$

$$2 = -\frac{1}{2} + c$$

$$c = \frac{5}{2}$$

$$y = \frac{1}{2}x + \frac{5}{2}$$

(b)

$$l_2: y = -2x + c$$

$$R(10, 0)$$

$$0 = -20 + c$$

$$c = 20$$

$$y = -2x + 20$$

$$l_1 y = \frac{1}{2}x + \frac{5}{2}$$

$$l_2 y = -2x + 20$$

$$-2x + 20 = \frac{1}{2}x + \frac{5}{2}$$

$$\frac{5}{2}x = -\frac{35}{2}$$

$$5x = 35$$

$$x = 7$$

$$S(7, 6)$$

(c)

$$R(10,0)$$

$$S(7,6)$$

$$\Delta x = 3 \quad \Delta y = 6$$

$$\text{Length} = \sqrt{3^2 + 6^2}$$

$$= \sqrt{45}$$

$$= 3\sqrt{5}$$

(d)

A suitable diagram will give  $\text{Area}\{PQR\} = 45$  square units.

End of C1 Solutions.