

(C1-8.1a) Name:

### Homework Questions 1 – Basic Integration

Find an expression for  $y$  when  $\frac{dy}{dx}$  is:

1.  $\frac{dy}{dx} = x^2$

$$y = \frac{x^3}{3} + c$$

2.  $\frac{dy}{dx} = x^3$

$$y = \frac{x^4}{4} + c$$

3.  $\frac{dy}{dx} = 2x^2$

$$y = \frac{2x^3}{3} + c$$

4.  $\frac{dy}{dx} = 3x^4$

$$y = \frac{3x^5}{5} + c$$

5.  $\frac{dy}{dx} = -2x^5$

$$y = -\frac{x^6}{6} + c$$

6.  $\frac{dy}{dx} = -4x^2$

$$y = -\frac{4x^3}{3} + c$$

7.  $\frac{dy}{dx} = 2x^{-3}$

$$y = -x^{-2} + c$$

8.  $\frac{dy}{dx} = -3x^{-2}$

$$y = 3x^{-1} + c$$

9.  $\frac{dy}{dx} = 3 \cdot 6x^{0.2}$

$$y = 3x^{1.2} + c$$

10.  $\frac{dy}{dx} = -2 \cdot 4x^{-1.2}$

$$y = 2x^{-0.2} + c$$

11.  $\frac{dy}{dx} = x^{\frac{1}{2}}$

$$y = \frac{2}{3}x^{\frac{3}{2}} + c$$

12.  $\frac{dy}{dx} = -2x^{-\frac{1}{2}}$

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

13.  $\frac{dy}{dx} = -5x^{-2}$

$$y = 5x^{-1} + c$$

14.  $\frac{dy}{dx} = 3x^{-\frac{2}{3}}$

$$y = 9x^{\frac{1}{3}} + c$$

15.  $\frac{dy}{dx} = -4x^{-\frac{1}{4}}$

$$y = -\frac{16}{3}x^{\frac{3}{4}} + c$$

16.  $\frac{dy}{dx} = -x^{\frac{3}{4}}$

$$y = -\frac{4}{7}x^{\frac{7}{4}} + c$$

17.  $\frac{dy}{dx} = 4$

$$y = 4x + c$$

18.  $\frac{dy}{dx} = -6x$

$$y = -3x^2 + c$$

19.  $\frac{dy}{dx} = 5x^4$

$$y = x^5 + c$$

20.  $\frac{dy}{dx} = -6x^{-3}$

$$y = 3x^{-2} + c$$

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### **Homework Questions 2 – Integration**

Find either y or f'(x) when given... (Simplify your answers if possible)

1.  $\frac{dy}{dx} = 3x^4 + 2x^2$

$$f(x) = \frac{3x^5}{5} + \frac{2x^3}{3} + c$$

2.  $f(x) = 6x^5 - 3x^4$

$$f(x) = x^6 - \frac{3x^5}{5} + c$$

3.  $\frac{dy}{dx} = 2x^4 - 3x^2 + x + 2$

$$y = \frac{2x^5}{5} - x^3 + \frac{x^2}{2} + 2x + c$$

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

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

5.  $\frac{dy}{dx} = 10x - 4x^3 + 2x^{-3}$

$$y = 5x^2 - x^4 - x^{-2} + c$$

6.  $f(x) = 7x^2 + 5x + 4$

$$f(x) = \frac{7x^3}{3} + \frac{5x^2}{2} + 4x + c$$

7.  $f(x) = -3x^{-4} - 2x^{-3} + 6$

$$f(x) = x^{-3} + x^{-2} + 6x + c$$

8.  $\frac{dy}{dx} = x^{\frac{1}{2}} + x^{\frac{1}{3}} - x^{\frac{1}{4}}$

$$y = \frac{2}{3}x^{\frac{3}{2}} + \frac{3}{4}x^{\frac{4}{3}} - \frac{4}{5}x^{\frac{5}{4}} + c$$

9.  $\frac{dy}{dx} = x^{-\frac{2}{3}} + 2x^{\frac{1}{2}} - 3x$

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

10.  $f(x) = 6 - 5x^{\frac{2}{3}} - 4x^{\frac{3}{4}}$

$$f(x) = 6x - 3x^{\frac{5}{3}} - \frac{16}{7}x^{\frac{7}{4}} + c$$

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### Homework Questions 3 – Integration using the Integral Sign

Integrate the following

1.  $\int 3x^2 + 2x - 5 \, dx$

$$x^3 + x^2 - 5x + c$$

2.  $\int 5x^2 - 3x + 6 \, dx$

$$\frac{5x^3}{3} - \frac{3x^2}{2} + 6x + c$$

3.  $\int 2x^2 + 5x - 3 \, dx$

$$\frac{2x^3}{3} + \frac{5x^2}{2} - 3x + c$$

4.  $\int 4x^{-2} + 3x^{-3} \, dx$

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

5.  $\int 2x^{-\frac{2}{3}} + 3x^{-\frac{3}{4}} \, dx$

$$6x^{\frac{1}{3}} + 12x^{\frac{1}{4}} + c$$

6.  $\int 7x^{-5} + 5x^{-3} + 4 \, dx$

$$-\frac{7x^{-4}}{4} - \frac{5x^{-2}}{2} + 4x + c$$

7.  $\int x^3 + x^2 + x + 1 \, dx$

$$\frac{x^4}{4} + \frac{x^3}{3} + \frac{x^2}{2} + x + c$$

8.  $\int 5x^{-3} + 2x^{-2} + x \, dx$

$$-\frac{5x^{-2}}{2} - 2x^{-1} + \frac{x^2}{2} + c$$

9.  $\int 9x^5 + 8x^4 + 7x^3 + 3 \, dx$

$$\frac{3x^6}{2} + \frac{8x^5}{5} + \frac{7x^4}{4} + 3x + c$$

10.  $\int 6x + 4 \, dx$

$$3x^2 + 4x + c$$

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### Homework Questions 4 – Separate Integration

Integrate the following

1.  $\int \frac{2}{x^2} - 3x \, dx$

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

2.  $\int \sqrt{x} + \frac{3}{x^2} \, dx$

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

3.  $\int x(x - 4) \, dx$

$$y = \frac{x^3}{3} - 2x^2 + c$$

4.  $\int (x + 2)^2 \, dx$

$$y = \frac{x^3}{3} + 2x^2 + 4x + c$$

5.  $\int (x - 4)(x + 2) \, dx$

$$y = \frac{x^3}{3} - x^2 - 8x + c$$

6.  $\int \frac{x^3 - 3x}{4x} \, dx$

$$y = \frac{x^3}{12} - \frac{3x}{4} + c$$

7.  $\int \frac{2}{\sqrt[3]{x}} + \frac{1}{\sqrt{x^3}} + 1 \, dx$

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

8.  $\int \sqrt[3]{x} + 3\sqrt{x} \, dx$

$$y = \frac{3}{4}x^{\frac{4}{3}} + 2x^{\frac{3}{2}} + c$$

9.  $\int \frac{\sqrt{x} + 2x^4}{x^2} \, dx$

$$y = 2x^{\frac{1}{2}} + \frac{2x^3}{3} + c$$

10.  $\int (\sqrt{x} + 3)^2 \, dx$

$$y = \frac{x^2}{2} + 4x^{\frac{3}{2}} + 9x + c$$

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### **Homework Questions 5 – Integrating a derived function**

Find the equation of the curve when you are given the derived function and a given point

1.  $\int 4 - 3x \, dx$  at (-2,4)

$$y = 4x - \frac{3x^2}{2} + 18$$

2.  $\int 6x^2 - 5x - 25 \, dx$  at (-2,0)

$$y = 2x^3 - \frac{5x^2}{2} - 25x + 24$$

3.  $\int 12x^2 + x + 1 \, dx$  at (2, 24)

$$y = 4x^3 + \frac{x^2}{2} + x - 12$$

4.  $\int 2x + 1 \, dx$  at (1,1)

$$y = x^2 + x - 1$$

5.  $\int x^2 + 2x - 15 \, dx$  at (3,-5)

$$y = \frac{x^3}{3} + x^2 - 15x + 22$$

6.  $\int -6x^2 + 4x + 2 \, dx$  at (0,0)

$$y = -2x^3 + 2x^2 + 2x$$

7.  $\int 3x^2 - 12x + 12 \, dx$  at (0,3)

$$y = x^3 - 6x^2 + 12x + 3$$

8.  $\int 2x \, dx$  at (2,1)

$$y = x^2 - 3$$

9.  $\int 3 - 4x \, dx$  at (-2,1)

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

10.  $\int 6x^2 - 4x - 1 \, dx$  at (-1,-1)

$$y = 2x^3 - 2x^2 - x + 2$$