DERIVATIVES OF $f(x)=c$, $f(x)=x$, $f(x)=x^2$, $f(x)=x^n$
DERIVATIVE OF THE SUM OF TWO FUNCTIONS

1 Find the derivative of:

(a) $y=3x^2+2x-1$ **(b)** $y=4x-3x^2$ **(c)** $y=7x-4x^2$

(d) $y=x^4+x^2+1$ **(e)** $y=x^5-x^3+x$ **(f)** $v=t^3+4t^2-2t+5$

2 Find the derivative of:

(a) $y=x^{\frac{3}{2}}$ **(b)** $y=\frac{2}{x}$ **(c)** $y=2\sqrt{x}$ **(d)** $v=\sqrt[3]{t^2}$ **(e)** $h(m)=\frac{1}{m^3}$ **(f)** $f(x)=\frac{1}{\sqrt{x}}$

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4 Expand each expression and find $\frac{dy}{dx}$.

(a) $y=(x-1)(x+2)$ **(b)** $y=3x(x^2-2)$ **(c)** $y=(2x-3)^2$

(d) $y=(x-4)(x+4)$ **(e)** $y=(2x-3)^3$ **(f)** $y=(x-2)(x+1)(3x+1)$

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6 Find $f'(x)$.

(a) $f(x)=x+\sqrt{x}$ **(b)** $f(x)=x^2+\frac{1}{x}$ **(c)** $f(x)=x^2+x+1+\frac{1}{x}+\frac{1}{x^2}$

(d) $f(x)=x^{\frac{2}{3}}+x^{\frac{1}{3}}$ **(e)** $f(x)=\left(x-\frac{1}{x}\right)^2$ **(f)** $f(x)=x\sqrt{x}$

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7 For $f(x) = 3x^2 - 2x + 7$, indicate whether each statement is correct or incorrect.

(a) $f'(x) = 6x - 2$ **(b)** $f'(0) = 7$ **(c)** $f(1) = 8$ **(d)** $f'(2) = 10$

8 For each of the following functions, find the value of x for which $f'(x) = 0$.

(a) $f(x) = x^2 - 4$ **(b)** $f(x) = 2x^3 - 6x$ **(c)** $f(x) = x^3 - 4x^2$

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9 Find the gradient of the curve $y = x^2 - x - 6$ at the points where $y = 0$.

11 Show that the graph of $y = x^2 + 4x - 12$ crosses the x-axis at two points. Find the gradient of the curve at these points.

DERIVATIVES OF $f(x)=c$, $f(x)=x$, $f(x)=x^2$, $f(x)=x^n$
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13 Find the coordinates of the points on the curve $y = x^2 - 5x + 6$ at which the tangent:

(a) makes an angle of 45° with the x-axis

(b) is parallel to the line with equation $3x + y - 4 = 0$

(c) is perpendicular to the line with equation $2y - x + 3 = 0$.

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DERIVATIVE OF THE SUM OF TWO FUNCTIONS

17 The profit function, in dollars, for a manufacturer is given by the function $P = 6x - \frac{x^2}{2} - 10$, where x is the number of items produced in a day up to a maximum of 6 items.

(a) If the break-even point is when the profit is zero, what is the break-even point for this manufacturer?

(b) Find $\frac{dP}{dx}$.

(c) For what values of x is $\frac{dP}{dx} > 0$?

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DERIVATIVE OF THE SUM OF TWO FUNCTIONS

20 **(a)** Given $f(x) = x^2 + 3$, find $f'(x)$.

(b) On the same diagram sketch the graph of $y = f(x)$ and $y = f'(x)$.