

No Calculator

1. If $f(x) = e^4$, then find $f'(x)$

f' constant = $\boxed{0}$

2. Evaluate each:

a) $\lim_{h \rightarrow 0} \frac{\cos(\pi+h) - \cos \pi}{h} =$

b) $\lim_{h \rightarrow 0} \frac{\sin(2\pi+h) - \sin 2\pi}{h} =$



this is the derivative of \cos @ π $-\sin \pi = \boxed{0}$

$\rightarrow f'$ of \sin @ 2π $\rightarrow \cos 2\pi = \boxed{1}$

3. $\int_{-3}^{-1} \sqrt{3}x^{-4} dx =$

$\sqrt{3} \int_{-3}^{-1} x^{-4} dx = \sqrt{3} \left[\frac{1}{-3} x^{-3} \right]_{-3}^{-1} = -\frac{\sqrt{3}}{3} \left((-1)^{-3} - (-3)^{-3} \right) = -\frac{\sqrt{3}}{3} \left(-1 - \frac{1}{-27} \right) = \frac{\sqrt{3}}{3} \left(-1 + \frac{1}{27} \right) = -\frac{\sqrt{3}}{3} \left(\frac{-26}{27} \right) = \frac{26\sqrt{3}}{81}$

4. Find the slope of the line tangent to the curve $x^3 + xy^2 + 2x = 12$ at the point $(1, -3)$

$3x^2 + x \cdot 2y y' + y^2 + 2 = 0$

$2xyy' = -3x^2 - y^2 - 2$
 $y' = \frac{-3x^2 - y^2 - 2}{2xy}$

@ $(1, -3)$ $y' = \frac{-3(1) - 9 - 2}{2(1)(-3)} = \frac{-14}{-6} = \frac{7}{3}$

$y + 3 = \frac{7}{3}(x - 1)$

5. $\lim_{x \rightarrow 25} \frac{5 - \sqrt{x}}{x - 25} =$ Need to test $\lim_{x \rightarrow 25^-}$ and 25^+

OR L'Hôpital

$\lim_{x \rightarrow 25} \frac{-\frac{1}{2}x^{-\frac{1}{2}}}{1} = -\frac{1}{2} \left(\frac{1}{5} \right) = \boxed{-\frac{1}{10}}$

Calculator

1. If the rate of $(2x^3)$ increases $\frac{dx}{dt}$ twice the rate of $(6x^2)$ increases. What is the value of x ?

$\frac{dx}{dt} = 6x^2$

$\frac{dx}{dt} = 12x$

$6x^2 = 2(12x) \rightarrow$

$6x^2 - 24x = 0$

$6x(x - 4) = 0$

$x = 0 \text{ \& } 4$

2. Suppose $f(x) = |4x - 8|$.

Is $f(x)$ differentiable at $x = 2$? \rightarrow No kink

Is $f(x)$ continuous at $x = 2$? \rightarrow YES

Find the $\lim_{x \rightarrow 2} f(x)$ 0

3. If $g(x) = \frac{f(x) - x}{f(x)}$, $f(2) = 5$ and $f'(2) = -4$, then $g'(2) =$

$g'(x) = \frac{f(x) \cdot [f'(x) - 1] - [f(x) - x] \cdot f'(x)}{[f(x)]^2} = \frac{5[-4-1] - [5-2] \cdot (-4)}{5^2} = \frac{-25+12}{25}$

Fix

$\frac{f(x)}{f(x)}$