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Assegnment

1. $\lim_{h\to 0} \frac{2(-3+h)^2-18}{h}$

$\lim_{h\to 0} \frac{2(h-3)^2-18}{h}$

$\lim_{h\to 0} \frac{2(h^2+9-6h)-18}{h}$

$\lim_{h\to 0} \frac{2h^2+\cancel{18}-12h-\cancel{18}}{h}$

$\lim_{h\to 0} 2h-12 = \underline{\underline{-12}}$

2. $g(x)\begin{cases} 2x & x<6 \\ x-1 & x\geq 6 \end{cases}$

3. $\lim_{x \to 9} \dfrac{x - 9}{3 - \sqrt{x}}$

$\lim_{x \to 9} \dfrac{1}{\frac{-1}{2x^{1/2}}}$

$\lim_{x \to 9} 1\left(-2x^{1/2}\right)$

$\lim_{x \to 9} -2\sqrt{x}$

-6

4.

5. $\lim_{x\to\infty} \frac{6e^{4x}-e^{-2x}}{8e^{4x}-e^{2x}+3e^{-x}}$

$\lim_{x\to\infty} \frac{6e^{6x}-1}{8e^{6x}-e^{4x}+3e^{x}}$

$\lim_{x\to\infty} \frac{6-\frac{1}{e^{6x}}}{8-\frac{1}{e^{2x}}+\frac{3}{e^{5x}}}$

$\lim_{x\to\infty} \frac{6}{8} = \frac{3}{4}$

6. $g(y) = \begin{cases} y^2+5 & y < -2 \\ 1-3y & y \geq -2 \end{cases}$

a. $\lim_{y\to 6} g(y)$

$\lim_{y\to 6} 1-3y$

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7. $f(t) = 4t^2 - t(t^3 - 8t^2 + 12)$

$f'(t) = 4t^2 - t(3t^2 - 16t) + t^3 - 8t^2 + 12(8t - 1)$

$= 12t^4 - 64t^3 - 3t^3 + 48t^2 + 8t^4 - t^3 - 64t^3 + 8t^2 + 96t -$

$= 20t^4 - 13\cancel{2}2t^3 + 56t^2 + 96t - 12$

$= 10t^4 - 66t^3 + 28t^2 + 48t - 6$

$= 5t^4 - 33t^3 + 14t^2 + 24t - 3$

8. $R(w) = \dfrac{3w + w^4}{2w^2 + 1}$

$R'(w) = \dfrac{2w^2 + 1(3 + 4w^3) - 3w\cancel{+}w^4(4w)}{(2w^2+1)^2}$

$= \dfrac{6w^2 + 8w^5 + 3 + 4w^3 - 12w^2 + 4w^5}{(2w^2+1)^2}$

$= \dfrac{12w^5 + 4w^3 - 6w^2 + 3}{4w^4 + 1 + 4w^2}$

9. $f(x) = 2e^x - 8^x$

$f'(x) = 2e^x - 8^x \ln 8$

10. $f(x) = z^5 - e^2 \ln(z)$

$f'(x) = 5z^4 - \dfrac{e^2}{z} + \ln(z)e^2$

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

$f'(x) = 4(6x^2 + 7x)^3 \cdot (12x + 7)$

b. $f(x) = 5 + e^{4t + t^7}$

$= e^{4t+t^7}(4 + 7t^6)$

12. a. $z = \ln(7 - x^3)$

$z' = \dfrac{1}{7 - x^3} \cdot (-3x^2)$

$z'' = \dfrac{(7 - x^3)(-6x) - (-3x^2)(-3x^2)}{(7 - x^3)^2}$

$= \dfrac{-42x + 6x^4 - 9x^4}{(7 - x^3)^2} = \dfrac{-42x - 3x^4}{(7 - x^3)^2}$

b $Q(v) = \dfrac{2}{(6+2v-v^2)^4} = 2(6+2v-v^2)^{-4}$

$Q'(v) = -4(6+2v-v^2)^{-5} \cdot (2-2v)$

$= 8v - 8(6+2v-v^2)^{-5}$

$Q''(v) = (8v-8) \cdot -5(6+2v-v^2)^{-6} \cdot (2-2v) + (6+2v-v^2)^{-5} \cdot 8$

c $f(t) = \ln(1+t^2)$

$f'(t) = \dfrac{1}{1+t^2} \cdot 2t$

$f''(t) = \dfrac{1+t^2(2) - 2t(2t)}{(1+t^2)^2}$

$= \dfrac{2+2t^2-4t^2}{(1+t^2)^2} = \dfrac{2-2t^2}{(1+t^2)^2}$

13 $x^3 - 3x^2 - 9x + 12$

$f'(x) = 3x^2 - 6x - 9$

$= x^2 - 2x - 3$

$f'(x) = 0$

$x^2 - 2x - 3 = 0$

$x^2 - 3x + x - 3 = 0$

$x(x-3) + 1(x-3) = 0$

$x = 3, -1$

$f''(x) = 2x - 2$

$f''(3) = 4$ $\qquad f''(-1) = -4$

Maximum at -1

Minimum at 3

14. $4x^3 - 18x^2 + 24x - 7$

$f'(x) = 12x^2 - 36x + 24$

$= x^2 - 3x + 2$

$f'(x) = 0$

$x^2 - 3x + 2 = 0$

$x^2 - 2x - x + 2 = 0$

$x(x-2) - 1(x-2) = 0$

$x = 1, 2$

$f''(x) = 2x - 3$

$f''(1) = -1$ $\quad$ $f''(2) = 1$

Max. at 1

Min. at 2

15.

b $Q(v) =$

$Q'(v) =$

$Q''(v) =$

c $f(t) =$

$f'(t)$

$f''(t)$

12 x^2

$f'(x)$

$f'($

$f''($

f''

M

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