Q1

Saturday, September 5, 2020 2:33 PM

A curve has equation $y = f(x)$.

(a) Write an expression for the slope of the secant line through the points $P(7, f(7))$ and $Q(x, f(x))$.

- ○ $\dfrac{f(x) - x}{f(7) - 7}$
- ○ $\dfrac{f(7) - 7}{f(x) - x}$
- ◉ $\dfrac{f(x) - f(7)}{x - 7}$
- ○ $\dfrac{x - 7}{f(x) - f(7)}$

(b) Write an expression for the slope of the tangent line at P.

- ◉ $\lim\limits_{x \to 7} \dfrac{f(x) - f(7)}{x - 7}$
- ○ $\lim\limits_{x \to 0} \dfrac{f(x) - x}{f(7) - 7}$
- ○ $\lim\limits_{x \to 0} \dfrac{f(x) - f(7)}{x - 7}$
- ○ $\lim\limits_{x \to 7} \dfrac{x - 7}{f(x) - f(7)}$

a) $P(7, f(7))$ $Q(x, f(x))$

$$M_{PQ} = \frac{\Delta y}{\Delta x} = \boxed{\frac{f(x) - f(7)}{x - 7}}$$

b) If P is $(7, f(x))$

Q is $(x\ f(x))$

Then $\boxed{m = \lim\limits_{x \to 7} \dfrac{f(x) - f(7)}{x - 7}}$

Q2

Saturday, September 5, 2020 8:10 PM

Find an equation of the tangent line to the curve at the given point.

$y = x^3 - 2x + 1, \quad (4, 57)$

$y = \boxed{46x - 127}$

$a = 4$ and $f(x) = 57$

$m = \lim_{x \to a} \dfrac{f(x) - f(a)}{x - a}$

$\lim_{x \to 4} \dfrac{f(x) - 57}{x - 4}$

$= \dfrac{(x^3 - 2x + 1) - 57}{x - 4}$

$= \dfrac{x^3 - 2x - 56}{x - 4}$ → Use rational root theorem

https://www.youtube.com/watch?v=gs0S9LpuxmE

$= \dfrac{\cancel{(x-4)}(x^2 + 4x + 14)}{\cancel{x-4}}$

$\lim_{x \to 4} = x^2 + 4x + 14$

$= (4)^2 + 4(4) + 14$

$= 16 + 16 + 4$

$= \underline{\underline{46}}$ slope of tangent line

equation of Tangent line:

$y - f(a) = f'(a)(x - a)$

$y - 57 = 46(x - 4)$

$y - 57 = 46x - 184$

$y = 46x - 184 + 57$

$y = \boxed{46x - 127}$

Q3

Sunday, September 6, 2020 6:15 PM

Find an equation of the tangent line to the curve at the given point.

$y = \sqrt{x}$, (49, 7)

$y = \boxed{\frac{1}{14}x + \frac{7}{2}}$

$y = \sqrt{x}$, (49, 7)

$a = 49 \quad f(a) = 7$

$m = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$

$$\lim_{x \to 49} \frac{\sqrt{x} - 7}{x - 49}$$

$$= \frac{\sqrt{x} - 7}{x - 49} \frac{(\sqrt{x} + 7)}{(\sqrt{x} + 7)}$$

$$= \frac{\cancel{x - 49}}{\cancel{(x-49)}(\sqrt{x} + 7)}$$

$$\lim_{x \to 49} = \frac{1}{\sqrt{x} + 7}$$

$$= \frac{1}{\sqrt{49} + 7}$$

$$f'(49) = \frac{1}{14}$$

Slope of Tangent line

equation of Tangent line:

$$y - f(a) = f'(a)(x - a)$$

$$y - 7 = \frac{1}{14}(x - 49)$$

$$y - 7 = \frac{1}{14}x - \frac{7}{2}$$

$$y = \frac{1}{14}x - \frac{7}{2} + 7$$

$$\boxed{y = \frac{1}{14}x + \frac{7}{2}}$$

Q4

Sunday, September 6, 2020 7:22 PM

(a) Find the slope m of the tangent to the curve $y = 7 + 4x^2 - 2x^3$ at the point where $x = a$.

$m = 8a - 6a^2$

(b) Find equations of the tangent lines at the points (1, 9) and (2, 7).

$y(x) = 2x + 7$ (at the point (1, 9))

$y(x) = -8x + 23$ (at the point (2, 7))

$y = 7 + 4x^2 - 2x^3$, $x = a$, $f(x) = y$

$$m = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

$$\lim_{h \to 0} \frac{7 + 4(a+h)^2 - 2(a+h)^3 - (7 + 4a^2 - 2a^3)}{h} = \frac{7 + 4(a^2 + 2ah + h^2) - 2(a^3 + 3a^2h + 3ah^2 + h^3) - 7 - 4a^2 + 2a^3}{h}$$

$$= \frac{7 + 4a^2 + 8ah + 4h^2 - 2a^3 - 6a^2h - 6ah^2 - 2h^3 - 7 - 4a^2 + 2a^3}{h} = \frac{8ah + 4h^2 - 6a^2h - 6ah^2 - 2h^3}{h}$$

$$= \frac{\cancel{h}(8a + 4h - 6a^2 - 6ah - 2h^2)}{\cancel{h}}$$

$$\lim_{h \to 0} 8a + 4h - 6a^2 - 6ah - 2h^2$$

$$= 8a + 4(0) - 6a^2 - 6a(0) - 2(0)^2$$

$$m = \boxed{8a - 6a^2}$$

Slope of tangent to the curve $y = 7 + 4x^2 - 2x^3$, $x = a$

equation of Tangent line.

$$y - f(a) = f'(a)(x - a)$$

at point (1, 9), $y(x) = ?$

$a = 1$

$m = 8a - 6a^2$
$= 8(1) - 6(1)^2$
$= 8 - 6$
$= 2$

$y - (9) = (2)(x - 1)$
$y - 9 = 2x - 2$
$= 2x - 2 + 9$

$$\boxed{y(x) = 2x + 7}$$

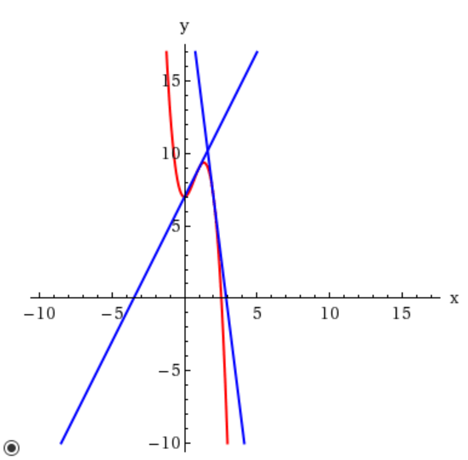
at point (2, 7), $y(x) = ?$

$a = 2$

$m = 8a - 6a^2$
$= 8(2) - 6(2)^2$
$= 16 - 24$
$= -8$

$y - (7) = (-8)(x - 2)$
$y - 7 = -8x + 16$
$= -8x + 16 + 7$

$$\boxed{y(x) = -8x + 23}$$



Q5

Monday, September 7, 2020 9:53 AM

(a) Find the slope m of the tangent to the curve $y = 7/\sqrt{x}$ at the point where $x = a > 0$.

$m = \boxed{-\frac{7}{2}a^{-\left(\frac{3}{2}\right)}}$

(b) Find equations of the tangent lines at the points (1, 7) and $\left(4, \frac{7}{2}\right)$.

$y(x) = \boxed{-\frac{7}{2}x + \frac{21}{2}}$ (at the point (1, 7))

$y(x) = \boxed{-\frac{7}{16}x + \frac{21}{4}}$ (at the point $\left(4, \frac{7}{2}\right)$)

$y = \frac{7}{\sqrt{x}}$, $x = a > 0$ $\quad m = \lim_{x\to a} \frac{f(x) - f(a)}{x - a}$

$$m = \lim_{x\to a} \frac{\frac{7}{\sqrt{x}} - \frac{7}{\sqrt{a}}}{x - a} = \frac{\frac{7(\sqrt{a})}{\sqrt{x}(\sqrt{a})} - \frac{7(\sqrt{x})}{\sqrt{a}(\sqrt{x})}}{x - a} = \frac{\frac{7\sqrt{a}}{\sqrt{xa}} - \frac{7\sqrt{x}}{\sqrt{xa}}}{x - a}$$

$$= \frac{\frac{7\sqrt{a} - 7\sqrt{x}}{\sqrt{xa}}}{x - a} = \frac{7\sqrt{a} - 7\sqrt{x}}{\sqrt{xa}} \cdot \frac{1}{x - a} = \frac{7\sqrt{a} - 7\sqrt{x}}{\sqrt{xa}\,(x - a)}$$

$$= \frac{7\sqrt{a} - 7\sqrt{x}}{\sqrt{xa}\,(x - a)} \cdot \frac{(7\sqrt{a} + 7\sqrt{x})}{(7\sqrt{a} + 7\sqrt{x})} = \frac{49a - 49x}{\sqrt{xa}\,(x - a)(7\sqrt{a} + 7\sqrt{x})}$$

$$= \frac{49(-x + a)}{\sqrt{xa}\,(x - a) \cdot 7(\sqrt{a} + \sqrt{x})} = \frac{-49\cancel{(x - a)}}{\sqrt{xa}\,\cancel{(x - a)} \cdot 7(\sqrt{a} + \sqrt{x})}$$

$$= \frac{-7}{\sqrt{xa}\,(\sqrt{a} + \sqrt{x})}$$

$$\lim_{x\to a} \frac{-7}{\sqrt{(a)a}\,(\sqrt{a} + \sqrt{a})} = \frac{-7}{\sqrt{a^2}\,(2\sqrt{a})}$$

$\sqrt{a^2} = |a| = \begin{cases} a & \boxed{a > 0} \\ -a & a < 0 \end{cases}$ $\quad f(x) = \frac{1}{\sqrt{x}}$ Domain: $x > 0$

$$= \frac{-7}{a(2\sqrt{a})} = \frac{-7}{2a^{\frac{3}{2}}} = -\frac{7}{2}a^{\frac{3}{2}}$$

$$\boxed{m = \frac{-7}{2a^{\frac{3}{2}}} \text{ or } -\frac{7}{2}a^{-\frac{3}{2}}}$$

equation of Tangent line.

$y - y_0 = m(x - x_0)$

(1, 7): $a = 1$, $f(a) = 7$

$$m = \frac{-7}{2(1)^{\frac{3}{2}}} = \frac{-7}{2}$$

$$y - 7 = -\frac{7}{2}(x - 1)$$

$$y = -\frac{7}{2}x + \frac{7}{2} + 7$$

$$\boxed{y = -\frac{7}{2}x + \frac{21}{2}}$$

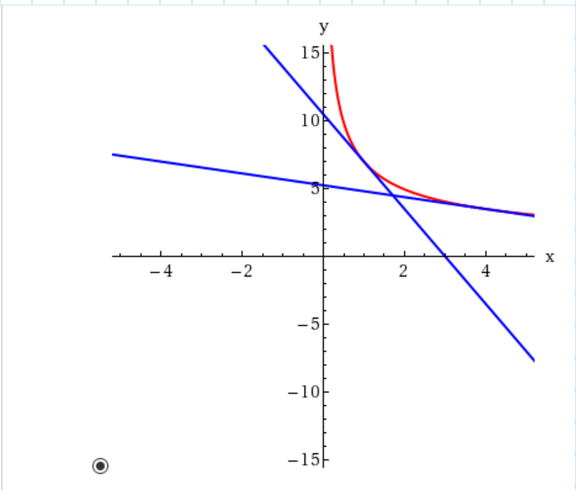
$\left(4, \frac{7}{2}\right)$: $a = 4$, $f(a) = \frac{7}{2}$

$$m = \frac{-7}{2(4)^{\frac{3}{2}}} = \frac{-7}{2(\sqrt{4})^3} = \frac{-7}{2(8)} = \frac{-7}{16}$$

$$y - \frac{7}{2} = \frac{-7}{16}(x - 4)$$

$$y = \frac{-7}{16}x + \frac{7}{4} + \frac{7}{2}$$

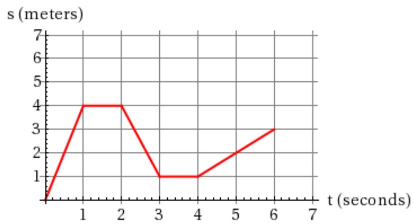
$$\boxed{y = -\frac{7}{16}x + \frac{21}{4}}$$



Q6

Monday, September 7, 2020 11:27 AM

(a) A particle starts by moving to the right along a horizontal line; the graph of its position function is shown in the figure.



For which of the following time intervals is the particle moving to the right? (Select all that apply.)

- ☑ (0, 1)
- ☐ (1, 2)
- ☐ (2, 3)
- ☐ (3, 4)
- ☑ (4, 6)

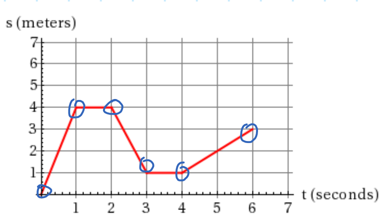
For which of the following time intervals is the particle moving to the left? (Select all that apply.)

- ☐ (0, 1)
- ☐ (1, 2)
- ☑ (2, 3)
- ☐ (3, 4)
- ☐ (4, 6)

For which of the following time intervals is the particle standing still? (Select all that apply.)

- ☐ (0, 1)
- ☑ (1, 2)
- ☐ (2, 3)
- ☑ (3, 4)
- ☐ (4, 6)

$\nearrow$ = Right $\searrow$ = Left $\longrightarrow$ = Still



On $(0,1)$, slope $= \frac{4-0}{1-0} = 4$

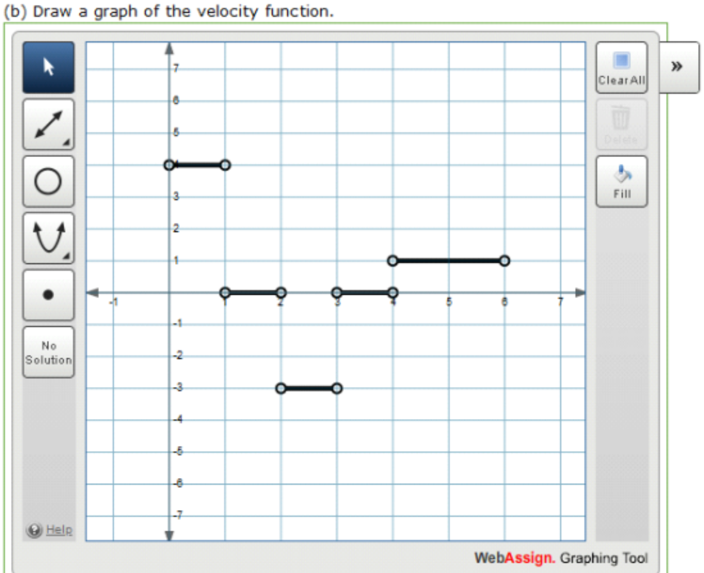
on $(1,2)$, slope $= 0$

on $(2,3)$, slope $= \frac{1-4}{3-2} = \frac{-3}{1} = -3$

on $(3,4)$, slope $= 0$

on $(4,6)$, slope $= \frac{3-1}{6-4} = \frac{2}{2} = 1$

(b) Draw a graph of the velocity function.



Submission Data

Q7

Monday, September 7, 2020 11:57 AM

If a ball is thrown into the air with a velocity of 39 ft/s, its height (in feet) after t seconds is given by $y = 39t - 16t^2$. Find the velocity when $t = 1$.

7 ✓ ft/s

$a = 1$, $y = f(t)$

$f(t) = 39t - 16t^2$

$f(1) = 39(1) - 16(1)^2$

$= 39 - 16$

$f(1) = 23$

$$v(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

$$v(1) = \lim_{h \to 0} \frac{f(1+h) - f(1)}{h}$$

$$= \frac{[39(1+h) - 16(1+h)^2] - 23}{h}$$

$$= \frac{39 + 39h - 16(1 + 2h + h^2) - 23}{h}$$

$$= \frac{39 + 39h - 16 - 32h - 16h^2 - 23}{h}$$

$$= \frac{16h^2 + 7h}{h} = \frac{\cancel{h}(16h + 7)}{\cancel{h}} = 16h + 7$$

$$\lim_{h \to 0} 16(0) + 7 = \boxed{7 \text{ ft/s}}$$

Q8

Monday, September 7, 2020 12:20 PM

If a rock is thrown upward on the planet Mars with a velocity of 16 m/s, its height (in meters) after t seconds is given by $H = 16t - 1.86t^2$.

(a) Find the velocity of the rock after one second.

m/s

(b) Find the velocity of the rock when $t = a$.

m/s

(c) When will the rock hit the surface? (Round your answer to one decimal place.)

$t =$ s

(d) With what velocity will the rock hit the surface?

m/s

$$v(a) = \lim_{h\to 0} \frac{f(a+h) - f(a)}{h}$$

when $t = 1$

$$f(t) = 16t - 1.86t^2$$

$$f(1) = 16(1) - 1.86(1)^2$$

$$= 16 - 1.86$$

$$f(1) = 14.14$$

$$v(1) = \lim_{h\to 0} \frac{f(1+h) - 14.14}{h}$$

$$= \frac{16(1+h) - 1.86(1+h)^2 - 14.14}{h}$$

$$= \frac{16 + 16h - 1.86(1 + 2h + h^2) - 14.14}{h}$$

$$= \frac{16 + 16h - 1.86 - 3.72h - 1.86h^2 - 14.14}{h}$$

$$= \frac{-1.86h^2 + 12.28h}{h} = \frac{\cancel{h}(-1.86h + 12.28)}{\cancel{h}}$$

$$\lim_{h\to 0} = -1.86h + 12.28$$

$$= -1.86(0) + 12.28$$

$$= \boxed{12.28 \text{ ft/s}} \quad \textbf{(a)}$$

when $t = a$

$$= \frac{16(a+h) - 1.86(a+h)^2 - (16a - 1.86a^2)}{h}$$

$$= \frac{16a + 16h - 1.86(a^2 + 2ah + h^2) - 16a + 1.86a^2}{h}$$

$$= \frac{\cancel{16a} + 16h - \cancel{1.86a^2} - 3.72ah + 1.86h^2 - \cancel{16a} + \cancel{1.86a^2}}{h}$$

$$= \frac{1.86h^2 - 3.72ah + 16h}{h} = \frac{\cancel{h}(1.86h - 3.72a + 16)}{\cancel{h}}$$

$$\lim_{h\to 0} = 1.86h - 3.72a + 16 = 1.86(0) - 3.72a + 16$$

$$= \boxed{-3.72a + 16 \text{ ft/s}} \quad \textbf{(b)}$$

$$H = 16t - 1.86t^2$$

$$(100) \quad 0 = 16t - 1.86t^2 \quad (100)$$

$$0 = 1600t - 186t^2$$

$$-186t^2 + 1600t = 0$$

quadratic formula

$$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$t = \frac{-1600 + \sqrt{1600^2 - 4(-186)0}}{2(-186)} = 0 \text{ s}$$

Initial velocity

$$t = \frac{-1600 - \sqrt{1600^2 - 4(-186)0}}{2(-186)} = \frac{800}{93} \approx \boxed{8.6 \text{ s}} \quad \textbf{(c)}$$

final velocity

$$f(8.6) = -3.72(8.6) + 16$$

$$= \boxed{-15.992 \text{ m/s}} \quad \textbf{(d)}$$

Q9

Monday, September 7, 2020 12:41 PM

The displacement (in meters) of a particle moving in a straight line is given by the equation of motion $s = 7/t^2$, where t is measured in seconds. Find the velocity of the particle at times $t = a$, $t = 1$, $t = 2$, and $t = 3$.

$t = a$	$v = \dfrac{-14}{a^3}$	m/s
$t = 1$	$v = -14$	m/s
$t = 2$	$v = -7/4$	m/s
$t = 3$	$v = -14/27$	m/s

$$v(a) = \lim_{h\to 0} \frac{S(a+h) - S(a)}{h} = \frac{\frac{7}{(a+h)^2} - \frac{7}{a^2}}{h}$$

$$= \frac{\frac{7}{(a+h)^2}\frac{(a^2)}{(a^2)} - \frac{7}{a^2}\frac{(a+h)^2}{(a+h^2)}}{h} = \frac{7a^2 - 7(a+h)^2}{a^2(a+h)^2} \cdot \frac{1}{h}$$

$$= \frac{7a^2 - 7(a^2+2ah+h^2)}{ha^2(a+h)^2} = \frac{\cancel{7a^2 - 7a^2} - 14ah - 7h^2}{ha^2(a+h)^2}$$

$$= \frac{-\cancel{h}(14a+7h)}{\cancel{h}\, a^2(a+h)^2} = \frac{-14a + 7h}{a^2(a+h)^2}$$

$$= \lim_{h\to 0} \frac{-14a+h}{a^2(a+h)^2} = \frac{-14a + (0)}{a^2(a+0)^2} = \frac{-14\cancel{a}}{a^2 \cdot a^{\cancel{2}}} = \boxed{\frac{-14}{a^3}\ m/s}$$

$$v(1) = \frac{-14}{a^3} = \frac{-14}{(1)^3} = \boxed{-14\ m/s}$$

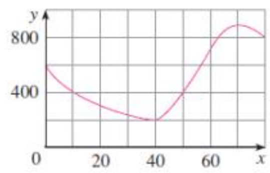
$$v(2) = \frac{-14}{a^3} = \frac{-14}{(2)^3} = \frac{-14}{8} = \boxed{-\frac{7}{4}\ m/s}$$

$$v(3) = \frac{-14}{a^3} = \frac{-14}{(3)^3} = \boxed{\frac{-14}{27}\ m/s}$$

Q10

Monday, September 7, 2020   4:27 PM

The graph of a function *f* is shown.



(a) Find the average rate of change of *f* on the interval [20, 70]. (Round your answer to the nearest integer.)

12 ✓

(b) Identify an interval on which the average rate of change of *f* is 0.

- ○ [0, 80]
- ○ [10, 40]
- ○ [20, 40]
- ◉ [10, 50]
- ○ [0, 60]

✓

(c) Which interval gives a larger average rate of change, [40, 50] or [40, 80]?

- ◉ [40, 50]
- ○ [40, 80]

✓

(d) Compute $\frac{f(40) - f(10)}{40 - 10}$.

-20/3 ✓

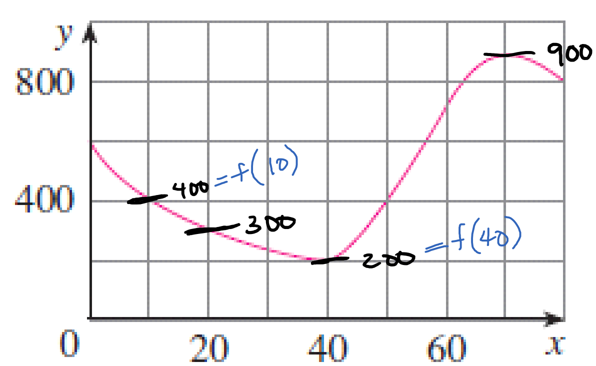
What does this value represent geometrically?

- ○ the slope of the tangent line at (15, *f*(15))
- ◉ the slope of the line segment from (10, *f*(10)) to (40, *f*(40))
- ○ the slope of the tangent line at (40, *f*(40))
- ○ the slope of the tangent line at (10, *f*(10))

✓

(a) Average rate of change $= \frac{\Delta y}{\Delta x}$

$$\frac{900 - 300}{70 - 20} = \boxed{12}$$



(d) $\frac{f(40) - f(10)}{40 - 10}$

$$= \frac{(200) - (400)}{40 - 10}$$

$$= \boxed{\frac{-20}{3}}$$

Q11

Monday, September 7, 2020 4:32 PM

Find an equation of the tangent line to the graph of $y = g(x)$ at $x = 5$ if $g(5) = -3$ and $g'(5) = 6$. (Enter your answer as an equation in terms of y and x.)

$y = g(x)$, $x = 5$, $g(5) = -3$, $g'(5) = 6$

$a = x$

equation of Tangent line.

$y - f(a) = f'(a)(x - a)$

$y - (-3) = 6(x - 5)$

$y + 3 = 6x - 30$

$y = 6x - 30 - 3$

$\boxed{y = 6x - 33}$

Q12

Monday, September 7, 2020 4:42 PM

If $f(x) = 7x^2 - x^3$, find $f'(1)$ and use it to find an equation of the tangent line to the curve $y = 7x^2 - x^3$ at the point $(1, 6)$.

$y = 11x - 5$

$f(x) = 7x^2 - x^3$

Derivative of a function

$$f'(a) = \lim_{h\to 0} \frac{f(a+h) - f(a)}{h}$$

$$f(1) = \lim_{h\to 0} \frac{f(1+h) - f(1)}{h} = \frac{7(1+h)^2 - (1+h)^3 - (7(1)^2 - (1)^3)}{h}$$

$$= \frac{7(1+2h+h^2) - (1+3h+3h^2+h^3) - (7-1)}{h} = \frac{\cancel{7} + 14h + 7h^2 \cancel{-1} - 3h - 3h^2 - h^3 \cancel{-6}}{h}$$

$$= \frac{-h^3 + 4h^2 + 11h}{h} = \frac{\cancel{h}(-h^2 + 4h + 11)}{\cancel{h}}$$

$$= \lim_{h\to 0} -h^2 + 4h + 11 = -(0)^2 + 4(0) + 11 = \underline{\underline{11}}$$

$$m = \frac{\Delta y}{\Delta x} = 11$$

$$= \frac{y-6}{x-1} = 11$$

$$= y - 6 = 11(x-1)$$

$$= y - 6 = 11x - 11$$

$$= y = 11x - 11 + 6$$

$$= \boxed{y = 11x - 5}$$

Q13

Monday, September 7, 2020 5:20 PM

Find $f'(a)$.

$$f(x) = 3x^2 - 4x + 1$$

$f'(a) =$ ☐

Derivative of a function

$$f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

$$f(x) = 3x^2 - 4x + 1$$

$$f'(a) = \lim_{h \to 0} \frac{3(a+h)^2 - 4(a+h) + 1 - [3(a)^2 - 4(a) + 1]}{h}$$

$$= \frac{3(a^2 + 2ah + h^2) - 4a - 4h + 1 - 3a^2 + 4a - 1}{h}$$

$$= \frac{\cancel{3a^2} + 6ah + 3h^2 \cancel{- 4a} - 4h \cancel{+1} \cancel{-3a^2} \cancel{+4a} \cancel{-1}}{h}$$

$$= \frac{3h^2 + 6ah - 4h}{h} = \frac{\cancel{h}(3h + 6a - 4)}{\cancel{h}}$$

$$\lim_{h \to 0} 3h + 6a - 4 = 3(0) + 6a - 4 = \underline{\underline{6a - 4}}$$

$$f'(a) = \boxed{6a - 4}$$

Q14

Monday, September 7, 2020 5:30 PM

Find $f'(a)$.

$$f(x) = \sqrt{3 - 4x}$$

$$f'(a) = \frac{-2}{\sqrt{3-4a}}$$

Derivative of a function

$$f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

$$f(x) = \sqrt{3 - 4x}$$

$$f'(a) = \lim_{h \to 0} \frac{\sqrt{3 - 4(a+h)} - \left(\sqrt{3 - 4(a)}\right)}{h}$$

$$= \frac{\sqrt{3 - 4a - 4h} - \sqrt{3 - 4a}}{h} \cdot \frac{\left(\sqrt{3-4a-4h} + \sqrt{3-4a}\right)}{\left(\sqrt{3-4a-4h} + \sqrt{3-4a}\right)}$$

$$= \frac{\sqrt{3-4a-4h}^{\,2} - \sqrt{3-4a}^{\,2}}{h\left(\sqrt{3-4a-4h} + \sqrt{3-4a}\right)} = \frac{\cancel{3} - \cancel{4a} - 4h \cancel{-3} \cancel{+4a}}{h\left(\sqrt{3-4a-4h} + \sqrt{3-4a}\right)}$$

$$= \frac{-4h}{h\left(\sqrt{3-4a-4h} + \sqrt{3-4a}\right)} = \frac{-4}{\sqrt{3-4a-4h} + \sqrt{3-4a}}$$

$$\lim_{h \to 0} = \frac{-4}{\sqrt{3-4a-4(0)} + \sqrt{3-4a}} = \frac{-4}{\sqrt{3-4a} + \sqrt{3-4a}}$$

$$= \frac{-4}{2\sqrt{3-4a}} = \frac{-2}{\sqrt{3-4a}}$$

$$f'(a) = \boxed{\frac{-2}{\sqrt{3-4a}}}$$