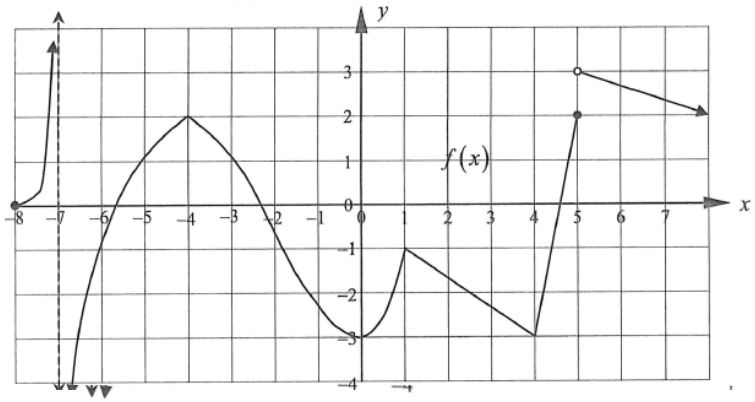
Unit 2 DAY 1 ASSIGNMENT

Textbook Page P9 #1 - 6, 12

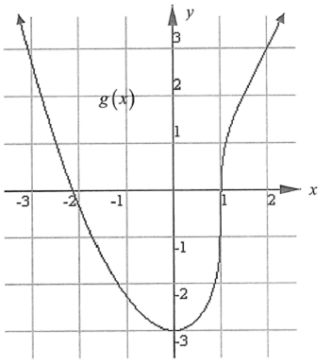
Unit 2 DAY 2 ASSIGNMENT

Duo Tang P13 # 1 – 6 Textbook Page 35 #2 & 7 (Formula 1)

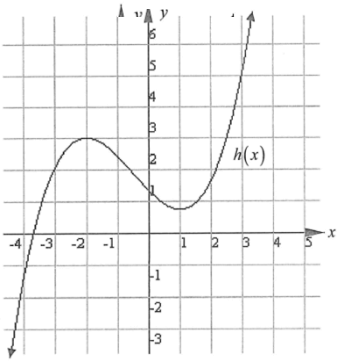
1. Study the graph of the function $f(x)$ below and give the values of x at which a tangent line does not exist.



2. Examine the graph of the function $g(x)$ at right.
   (a) At what value of x does the tangent line appear to be horizontal?
   (b) At what value of x does the tangent line appear to be vertical?
   (c) In what interval(s) does the slope of the tangent line appear to be negative?
   (d) In what interval(s) does the slope of the tangent line appear to be positive?



3. Ask your teacher for a copy of the graph of the function $h(x)$ below right. On this copy, draw what you consider to be the tangent lines at $x=-3$, $x=-1$, $x=1$, and $x=3$. By counting squares on the grid, estimate the slope of each of the four tangent lines you drew.



ESTIMATE the slope of the tangent lines drawn to the given function at the pont P by finding the slope of the secant lines $\overleftrightarrow{PQ_n}$ by creating a table similar to the one we did in example 2.

4. $f(x)=x^3$, $P(1,f(1))$,

5. $f(x)=\frac{2}{x}$, $P(2,f(2))$,

6. $f(x)=\sqrt{x}$, $P(4,f(4))$

Unit 2 DAY 3 ASSIGNMENT

Textbook Page 35 (ONLY USE FORMULA 2 TODAY) #1, 6ab (for i), 7abc for i, ii, v, 8ac, 9, 10

Unit 2 DAY 4 ASSIGNMENT

Textbook Page 43 # 1a (i & ii), 1b, 2a(i & iv), 2b, 3, 5a(i only), 5b (sketch the graph), 9

Unit 2 DAY 5 ASSIGNMENT

DUO TANG P 14/15: FA #1a-f & h, 2, 3, 4, 5, 7, 9

1. Use the definition of the derivative, namely $\frac{dy}{dx} = f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$, to find the derivative of each of the following functions. After finding the derivative, determine the slope of the tangent line to the curve at the points whose x-coordinates are -3, -1, 0, 1, and 3.
   (a) $f(x) = 2x^2 - 3x$
   (b) $f(x) = x^3 + 5x^2 - 7x - 2$
   (c) $f(x) = -3x - 8$
   (d) $f(x) = 10$
   (e) $y = -3x^4 + x$
   (f) $y = 4\sqrt{x}$
   (g) $y = \frac{2}{x^2}$
   (h) $y = |x|$
2. (a) Use the definition of the derivative to find the slope of the tangent line to any point on the function $f(x) = x^2 + 2x - 3$.
   (b) Use your result from part (a) to find the equation of the tangent line to $f(x)$ at the points $(-2, f(-2))$ and $(1, f(1))$. Leave your answer in slope-intercept form.
   (c) Use your results from part (b) to determine the coordinates of the point at which the two tangent lines intersect. (Hint: the point of intersection lies on both lines.)
3. Find the coordinates of the point on the graph of the function $f(x) = -2x^2 + 8x$ at which the slope of the tangent line is -8.
4. What limit would you have to take in order to find the derivative of the function $f(x) = \log_2 x$? You do not have to evaluate the limit.
5. A tangent line is drawn to the function $f(x) = 4 - x^2$ at the point $P(1,3)$. Find the area of the triangle formed in the first quadrant by the tangent line, the x-axis, and the y-axis.
7. Use your graphing calculator to determine the slope of the tangent line to the curve $y = \sqrt{\frac{x+1}{x-2}}$ at the point where $x = 3$.

9. A boating safety course was advertised in a small community, and the number of registrants x days after the advertising began is modelled by the function $f(x) = 60 - \frac{120}{x+2}$.

(a) Find the number of registrants after 2 days.
(b) Find the number of registrants after 8 days.
(c) Find $f'(x)$ using the definition of the derivative.
(d) Find $f'(2)$ and interpret your answer.
(e) Find $f'(8)$ and interpret your answer.
(f) Is the rate of registration increasing or decreasing as the days pass by?

Unit 2 DAY 6 ASSIGNMENT

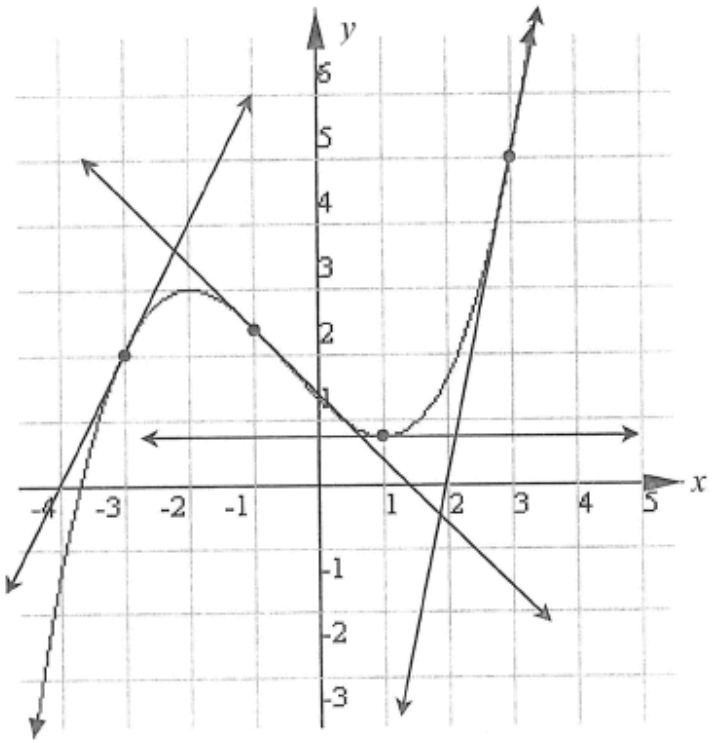
Textbook Page 75 #1b-d, 2, 3, 5, 6, 8bc, 10b, 11a, 12cd, 13, 14

CALCULUS 30: SOLUTIONS TO DUO TANG ASSIGNMENTS

SOLUTIONS TO: Unit 2 DAY 2 ASSIGNMENT

1. $x = -7$, $x = -4$, $x = 1$, $x = 4$, $x = 5$ 2. (a) $x = 0$ (b) $x = 1$ (c) $x \in (-\infty, 0)$ (d) $x \in (0,1) \cup (1, \infty)$

3.



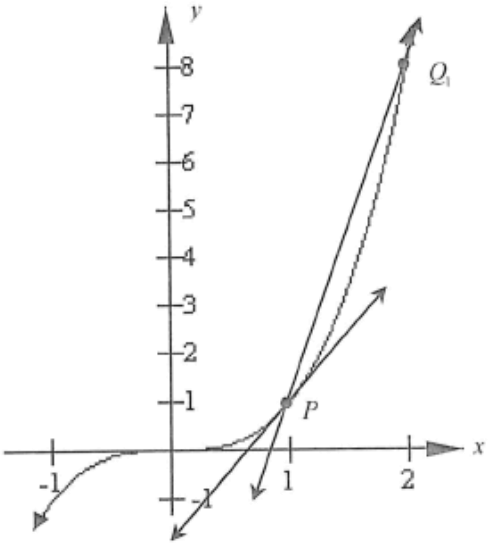
Answers close to the ones below are acceptable since it is difficult to draw accurate tangent lines unless you know their slopes in advance.
At $x = -3$, tangent line slope is 2.
At $x = -1$, tangent line slope is -1.
At $x = 1$, tangent line slope is 0.
At $x = 3$, tangent line slope is 5.

NOTE: For 4, 5, 6 only the right hand part of the table is shown.

4.

Point	x	$f(x)$	m of $\overline{PQ_n}$
P	1	1	----------
Q_1	2	8	$\frac{8-1}{2-1}=\frac{7}{1}=7$
Q_2	1.1	1.331	$\frac{1.331-1}{1.1-1}=\frac{0.331}{0.1}=\mathbf{3.31}$
Q_3	1.01	1.030301	$\frac{1.030301-1}{1.01-1}=\frac{0.030301}{0.01}=\mathbf{3.0301}$
Q_4	1.001	1.003003001	$\frac{1.003003001-1}{1.001-1}=\frac{0.003003001}{0.001}=\mathbf{3.003001}$
Q_5	1.0001	1.00030003	$\frac{1.00030003-1}{1.0001-1}=\frac{0.00030003}{0.0001}=\mathbf{3.0003}$

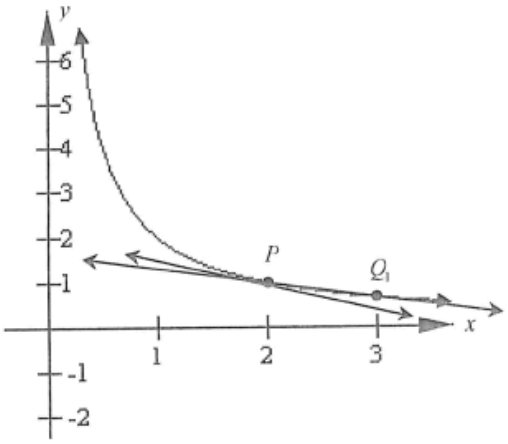
An estimate for the slope of the tangent line is 3.



5.

Point	x	$f(x)$	m of $\overline{PQ_n}$
P	2	1	----------
Q_1	3	0.6666666667	$\frac{0.6666666667-1}{3-2}=\frac{-0.333333333}{1}=\mathbf{-0.3333333333}$
Q_2	2.1	0.9523809524	$\frac{0.9523809524-1}{2.1-2}=\frac{-0.0476190476}{0.1}=\mathbf{-0.476190476}$
Q_3	2.01	0.9950248756	$\frac{0.9950248756-1}{2.01-2}=\frac{-0.0049751244}{0.01}=\mathbf{-0.49751244}$
Q_4	2.001	0.9995002499	$\frac{0.9995002499-1}{2.001-2}=\frac{-0.0004997501}{0.001}=\mathbf{-0.4997501}$
Q_5	2.0001	0.9999500025	$\frac{0.9999500025-1}{2.0001-2}=\frac{-0.0000499975}{0.0001}=\mathbf{-0.499975}$

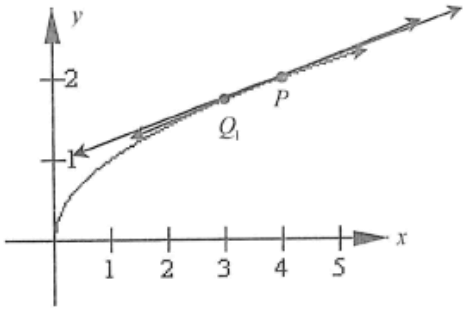
An estimate for the slope of the tangent line is -0.5.



6.

Point	x	$f(x)$	m of $\overline{PQ_n}$
P	4	2	----------
Q_1	3	1.732050808	$\frac{1.732050808-2}{3-4}=\frac{-0.267949192}{-1}=\mathbf{0.267949192}$
Q_2	3.9	1.974841766	$\frac{1.974841766-2}{3.9-4}=\frac{-0.025158234}{-0.1}=\mathbf{0.25158234}$
Q_3	3.99	1.997498436	$\frac{1.997498436-2}{3.99-4}=\frac{-0.002501564}{-0.01}=\mathbf{0.2501564}$
Q_4	3.999	1.999749984	$\frac{1.999749984-2}{3.999-4}=\frac{-0.000250016}{-0.001}=\mathbf{0.250016}$
Q_5	3.9999	1.999975	$\frac{1.999975-2}{3.9999-4}=\frac{-0.000025}{-0.0001}=\mathbf{0.25}$

An estimate for the slope of the tangent line is 0.25.



SOLUTIONS TO: Unit 2 DAY 5 ASSIGNMENT

1. (a) $f'(x)=4x-3$; $f'(-3)=-15$, $f'(-1)=-7$, $f'(0)=-3$, $f'(1)=1$, $f'(3)=9$

(b) $f'(x)=3x^2+10x-7$; $f'(-3)=-10$, $f'(-1)=-14$, $f'(0)=-7$, $f'(1)=6$, $f'(3)=50$

(c) $f'(x)=-3$; $f'(-3)=-3$, $f'(-1)=-3$, $f'(0)=-3$, $f'(1)=-3$, $f'(3)=-3$

(d) $f'(x)=0$; $f'(-3)=0$, $f'(-1)=0$, $f'(0)=0$, $f'(1)=0$, $f'(3)=0$

(e) $\frac{dy}{dx}=-12x^3+1$; $\left.\frac{dy}{dx}\right|_{x=-3}=325$, $\left.\frac{dy}{dx}\right|_{x=-1}=13$, $\left.\frac{dy}{dx}\right|_{x=0}=1$, $\left.\frac{dy}{dx}\right|_{x=1}=-11$, $\left.\frac{dy}{dx}\right|_{x=3}=-323$

(f) $\frac{dy}{dx}=\frac{2}{\sqrt{x}}=\frac{2\sqrt{x}}{x}$; $x=-3$ and $x=-1$ are not in the domain so $\frac{dy}{dx}$ has no meaning, $\left.\frac{dy}{dx}\right|_{x=0}$ does not exist because the tangent line is vertical, $\left.\frac{dy}{dx}\right|_{x=1}=2$, $\left.\frac{dy}{dx}\right|_{x=3}=\frac{2\sqrt{3}}{3}$

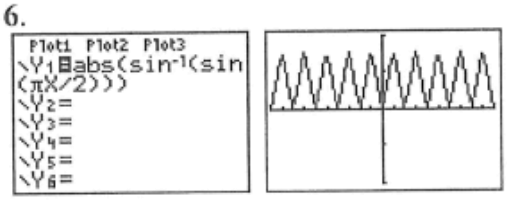
(g) $\frac{dy}{dx}=\frac{-4}{x^3}=-4x^{-3}$; $\left.\frac{dy}{dx}\right|_{x=-3}=\frac{4}{27}$, $\left.\frac{dy}{dx}\right|_{x=-1}=4$, $\left.\frac{dy}{dx}\right|_{x=0}$ does not exist because $x=0$ is not in the domain—it is the location of an infinite discontinuity, $\left.\frac{dy}{dx}\right|_{x=1}=-4$, $\left.\frac{dy}{dx}\right|_{x=3}=-\frac{4}{27}$

(h) $\frac{dy}{dx}=1,\ x>0$ and $\frac{dy}{dx}=-1,\ x<0$; $\left.\frac{dy}{dx}\right|_{x=-3}=-1$; $\left.\frac{dy}{dx}\right|_{x=-1}=-1$; $\left.\frac{dy}{dx}\right|_{x=0}$ does not exist because there is a kink in the graph; $\left.\frac{dy}{dx}\right|_{x=1}=1$; $\left.\frac{dy}{dx}\right|_{x=3}=1$

2. (a) $f'(x)=2x+2$ **(b)** $y=-2x-7$; $y=4x-4$ **(c)** $\left(-\frac{1}{2},-6\right)$ **3.** $(4,0)$ **4.** $\lim_{h\to 0}\frac{\log_2(x+h)-\log_2 x}{h}$

5. $\frac{25}{4}$ u^2

6.



The function is not differentiable at integral values of x because of the sharp corners or kinks.

7. $-\frac{3}{4}$

9. (a) 30 **(b)** 48 **(c)** $\frac{120}{(x+2)^2}$ **(d)** After 2 days, the registrations are being received at a rate of 7.5 people/day. **(e)** After 8 days, the registrations are being received at a rate of 1.2 people/day. **(f)** decreasing