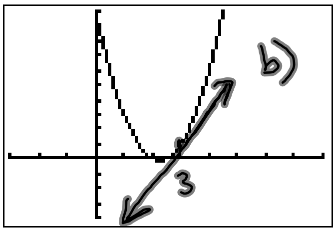
work: HW 1.4

1 2 3 4 5 6 7 8 9 10

Ex. Score: 0 of 1 pt **HW Score:** 3.08% (0.4 of 13 pts)

a) Graph the function $f(x) = 2x^2 - 9x + 10$.
b) Draw a tangent line to the graph at the point whose x-coordinate is 3.
c) Find $f'(x)$ by determining $\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$.
d) Find $f'(3)$. This slope should match that of the line you drew in part (b).

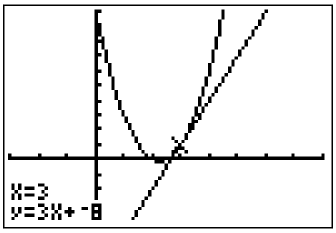
a)



b)

c) $f'(x) = 4x - 9$

d) $f'(3) = 4(3) - 9 = 3$



Find an equation for the tangent line to the graph of the given function at ~~(-5,30)~~. $x = -5$

$f(x) = x^2 + 5$ $\quad y = f(-5) = (-5)^2 + 5 = 30$

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

$m_T = f'(-5) = 2(-5) = -10$

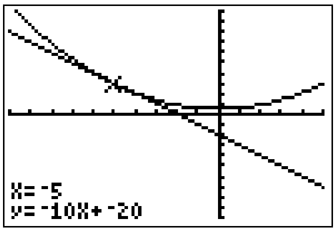
$y = mx + b$

$y = -10x + b$ | let $x = -5$, $y = 30$

$30 = -10(-5) + b$

$30 = 50 + b \Rightarrow b = -20$

$$\boxed{y = -10x - 20}$$



Find the equation of the tangent line to the graph of $f(x)=\frac{2}{x}$ at $\left(5,\frac{2}{5}\right)$.

$$f(x)=\frac{2}{x}=2x^{-1}$$

$$f'(x)=-2x^{-2}=\frac{-2}{x^2}$$

$$m_T=f'(5)=\frac{-2}{5^2}=\frac{-2}{25}=-.08$$

$$y=mx+b$$

$$y=\frac{-2}{25}x+b$$

let $x=5$

$y=\frac{2}{5}$

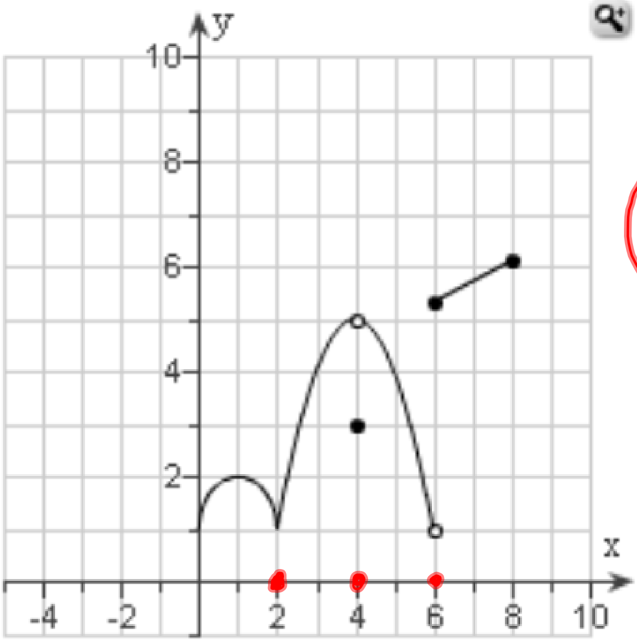
$$\frac{2}{5}=\frac{-2}{25}(5)+b \Rightarrow \frac{2}{5}=\frac{-2}{5}+b$$

$$\Rightarrow b=\frac{4}{5}$$

$$y=\frac{-2}{25}x+\frac{4}{5}$$

$$=-.08x+.8$$

List the points in the graph in the interval $0 < x < 8$ at which the function is not differentiable.



nondifferentiable at $x = 2, 4, 6$

Find g '(t) for the function $g(t) = \frac{6}{t^4}$. $= 6t^{-4}$

$g'(t) = -24t^{-5}$

$= \frac{-24}{t^5}$

$$
\begin{array}{ccccccccccc}
 & & & & & 1 & & & & & (t+h)^0 \\
 & & & & 1 & & 1 & & & & (t+h)^1 \\
 & & & 1 & & 2 & & 1 & & & (t+h)^2 = t^2+2th+h^2 \\
 & & 1 & & 3 & & 3 & & 1 & & (t+h)^3 = t^3+3t^2h+3th^2+h^3 \\
 & 1 & & 4 & & 6 & & 4 & & 1 & (t+h)^4 = t^4+4t^3h+6t^2h^2+4th^3+h^4 \\
1 & & 5 & & 10 & & 10 & & 5 & & 1 \quad \vdots
\end{array}
$$

$$g'(t) = \lim_{h\to 0}\left[\frac{g(t+h)-g(t)}{h}\right. =$$

$$\frac{\frac{6}{(t+h)^4} - \frac{6}{t^4}}{h} = \frac{6t^4 - 6(t+h)^4}{t^4(t+h)^4} \cdot \frac{1}{h} =$$

$$\frac{6t^4 - 6(t^4+4t^3h+6t^2h^2+4th^3+h^4)}{t^4(t+h)^4} \cdot \frac{1}{h} =$$

$$\frac{\cancel{6t^4} - \cancel{6t^4} - 24t^3h - 36t^2h^2 - 24th^3 - 6h^4}{t^4(t+h)^4} \cdot \frac{1}{h} =$$

$$\frac{\cancel{h}(-24t^3 - 36t^2h - 24th^2 - 6h^3)}{t^4(t+h)^4} \cdot \frac{1}{\cancel{h}}$$

$$\left.\frac{-24t^3 - 36t^2h - 24th^2 - 6h^3}{t^4(t+h)^4}\right] = \frac{-24t^3}{t^4t^4} =$$

$$\frac{-24t^3}{t^8} = \frac{-24}{t^5}$$

Find g $'(x)$ for the given function.

$$g(x) = \sqrt{2x} = \sqrt{2}\,\sqrt{x} = \sqrt{2}\,x^{\frac{1}{2}}$$

$$g'(x) = \frac{1}{2}\sqrt{2}\,x^{\frac{1}{2}-1}$$

$$= \frac{\sqrt{2}}{2}x^{-\frac{1}{2}} = \frac{\sqrt{2}}{2x^{1/2}}$$

$$= \frac{\sqrt{2}}{2\sqrt{x}}$$

$$\frac{\sqrt{2}}{2\sqrt{x}} \cdot \frac{\sqrt{x}}{\sqrt{x}} = \frac{\sqrt{2x}}{2x}$$

Find H ′(x) for the given function.

$$H(x) = \frac{7}{\sqrt{x+6}}$$

$$\lim_{h \to 0} \left[\frac{H(x+h) - H(x)}{h} \right. = \frac{\frac{7}{\sqrt{x+h+6}} - \frac{7}{\sqrt{x+6}}}{h} =$$

$$\frac{7\sqrt{x+6} - 7\sqrt{x+h+6}}{\sqrt{x+h+6}\,\sqrt{x+6}} \cdot \frac{1}{h} =$$

$$\frac{7}{h} \cdot \frac{\sqrt{x+6} - \sqrt{x+h+6}}{\sqrt{x+h+6}\,\sqrt{x+6}} \cdot \frac{\sqrt{x+6} + \sqrt{x+h+6}}{\sqrt{x+6} + \sqrt{x+h+6}} =$$

$$x+6-x-h-6$$

$$\frac{7}{h} \cdot \frac{(x+6)-(x+h+6)}{\sqrt{x+h+6}\,\sqrt{x+6}\left(\sqrt{x+6}+\sqrt{x+h+6}\right)} =$$

$$\frac{7}{h} \cdot \frac{-h}{\sim\sim\sim} = \left. \frac{-7}{\sqrt{x+h+6}\,\sqrt{x+6}\left(\sqrt{x+6}+\sqrt{x+h+6}\right)} \right] =$$

$$\frac{-7}{(x+6)\left(2\sqrt{x+6}\right)} = \frac{-7}{2(x+6)^{3/2}}$$