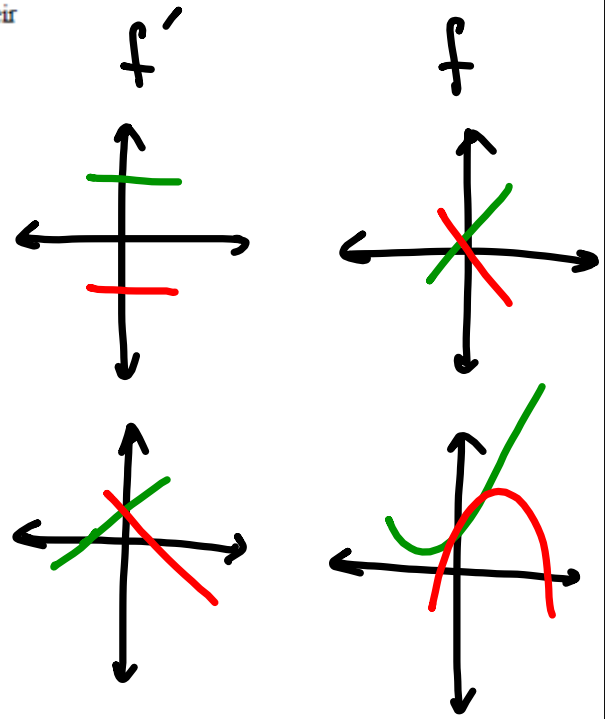
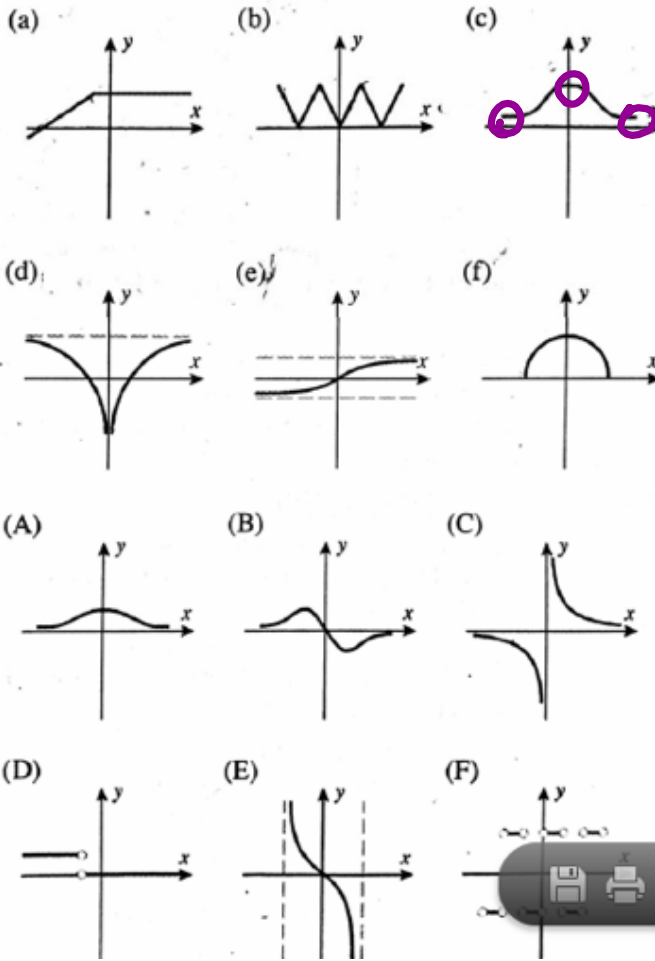


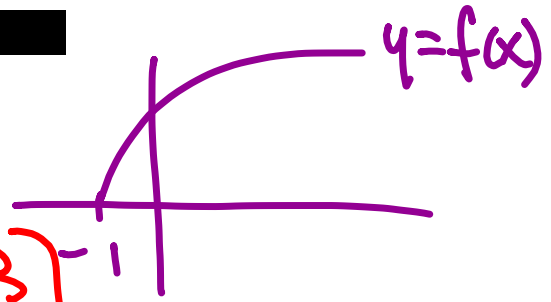
27. Match the graphs of the functions shown in (a) – (f) with the graphs of their derivatives in (A) – (F).



Handwritten red and purple annotations. Red arrows point from the top-left f' graph to (A) and (B). Red arrows point from the top-right f graph to (C) and (D). Purple arrows point from the bottom-left f' graph to (E) and (F). Purple arrows point from the bottom-right f graph to (A) and (B). There are also some purple scribbles and symbols.

37. Verify that the hypotheses of the Mean Value Theorem are satisfied on the given interval and find all values of c in that interval that satisfy the conclusion of the theorem for $f(x) = \sqrt{x+1}$ on the interval $[0, 3]$.

Since the function is
cont. & diff. over $[0, 3]$



We can use MVT.

$$\frac{f(b) - f(a)}{b - a} = f'(c), \quad a < c < b$$

$$\frac{f(3) - f(0)}{3 - 0} = \frac{2 - 1}{3} = \frac{1}{2\sqrt{c+1}}$$

$$\frac{1}{3} = \frac{1}{2\sqrt{c+1}}$$

$$3 = 2\sqrt{c+1}$$

$$\frac{3}{2} = \sqrt{c+1}$$

$$\frac{9}{4} = c+1$$

$$\frac{5}{4} = c$$

38. Given $y = \sqrt{\ln x}$, find $y'(e^5)$.

39. Given $y = e^{7x}$, find $y'(\ln 5)$.

40. Given $y = \pi^{\sin x}$, find $y'(\pi)$.

$$* \ln e^5 = 5 \ln e$$

$$38) y = (\ln x)^{\frac{1}{2}}$$

$$y' = \frac{1}{2} (\ln x)^{-\frac{1}{2}} \cdot \frac{1}{x} = \frac{1}{2e^5 \sqrt{5}}$$

$$= \frac{1}{2x \sqrt{\ln x}} \Big|_{x=e^5} = \frac{1}{2e^5 \sqrt{\ln e^5}}$$

$$39) \quad y = e^{7x}$$

$$y' = 7e^{2x} \Big|_{\ln 5} = 7e^{7(\ln 5)}$$

$$\ln e^k = k$$

$$e^{\ln k} = k$$

$$= 7e^{\ln 5^7}$$

$$= 7 \cdot 5^7$$

$$40) y = \pi^{\sin x}$$

$$y' = \pi^{\sin x} \cdot \ln \pi \cdot \cos x \Big|_{x=\pi}$$

$$= \pi^{\sin \pi} \ln \pi \cdot \cos \pi$$

$$= 1 \cdot \ln \pi \cdot (-1) = -\ln \pi$$

$$= \ln \pi^{-1} = \ln \left(\frac{1}{\pi} \right)$$

28. Given the following table of values, find the indicated derivatives:

x	$f(x)$	$f'(x)$
2	1	7
8	5	-3

(a) $g'(2)$ where $g(x) = [f(x)]^3$

(b) $h'(2)$ where $h(x) = f(x^3)$

$$a) g'(x) = 3[f(x)]^2 f'(x)$$

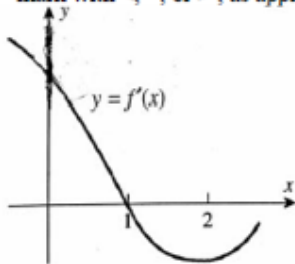
$$\begin{aligned} & \xrightarrow{x=2} 3(f(2))^2 \cdot f'(2) \\ & = 3(1)^2 \cdot 7 = 21 \end{aligned}$$

$$b) h'(x) = f'(x^3) \cdot 3x^2$$

$$\xrightarrow{x=2} f'(8) \cdot 3(2)^2$$

$$= (-3)12 = -36$$

33. Use the graph of $y = f'(x)$ in the accompanying figure to replace the question mark with $<$, $=$, or $>$, as appropriate. Explain your reasoning.



(a) $f(0) ? f(1)$

(b) $f(1) ? f(2)$

(c) $f'(0) ? 0$

(d) $f'(1) ? 0$

(e) $f''(0) ? 0$

(f) $f''(2) ? 0$

Handwritten blue annotations: a wavy line next to (a) and (b), and three vertical bars next to (c), (d), and (f).

41. Find the absolute maximum and minimum values of f on the given closed interval and state where those values occur for $f(x) = \sin x - \cos x$ on the interval $[0, \pi]$.

$$f' = \cos x + \sin x = 0$$

$$\sin x = -\cos x$$

$$\tan x = \frac{\sin x}{\cos x} = -1$$

x	y
0	-1
$\frac{3\pi}{4}$	$\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} = \sqrt{2}$
π	+1