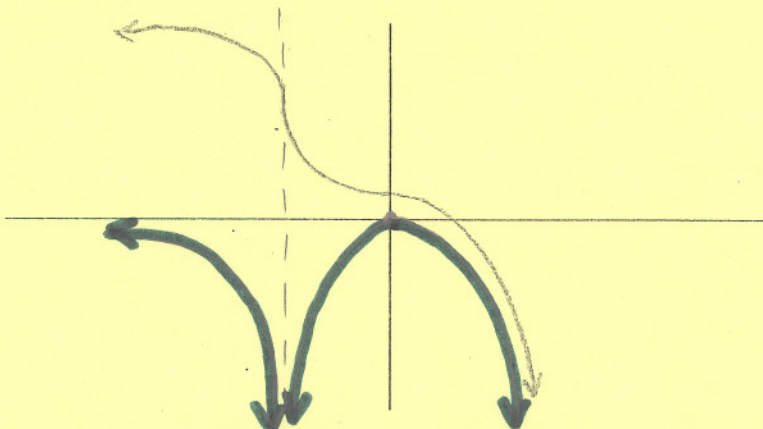


SCORE: ____ / 10 POINTS

NO CALCULATORS ALLOWED

Sketch the derivative of the following function on the same set of axes.

SCORE: ____ / 4 POINTS



When a fixed quantity of a gas is compressed to a volume of x liters, the pressure exerted by the gas (in atmospheres) is given by $f(x)$. Interpret the following algebraic statements, making sure to specify the units of all numbers you mention.
NOTE: Do NOT use the phrases "rate of change", "tangent line", "secant line" or "derivative of".

SCORE: ____ / 2 POINTS

$$\frac{f(6.75) - f(7.25)}{-0.5} = 0.3$$

WHEN THE GAS IS COMPRESSED FROM 7.25 L TO 6.75 L,
THE PRESSURE IT EXERTS INCREASES BY 0.3 ATMOSPHERES
PER LITER COMPRESSED ON AVERAGE

If $y = \frac{3x^2 - 4}{\sqrt[3]{x}}$, find $\frac{d^2y}{dx^2}$. Simplify your answer completely.

SCORE: ____ / 2 POINTS

$$y = 3x^{5/3} - 4x^{-1/3}$$

$$\frac{dy}{dx} = 5x^{2/3} + \frac{4}{3}x^{-4/3}$$

$$\frac{d^2y}{dx^2} = \frac{10}{3}x^{-1/3} - \frac{16}{9}x^{-7/3}$$

Find a quadratic function $f(x)$ such that $f(1) = 4$, $f'(1) = -3$ and $f''(1) = 2$. Show your work.

SCORE: ____ / 3 POINTS

$$f(x) = ax^2 + bx + c$$

$$f'(x) = 2ax + b$$

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

$$f(1) = a + b + c = 4 \rightarrow 1 - 5 + c = 4 \rightarrow c = 8$$

$$f'(1) = 2a + b = -3 \rightarrow 2 + b = -3 \rightarrow b = -5$$

$$f''(1) = 2a = 2 \rightarrow a = 1$$

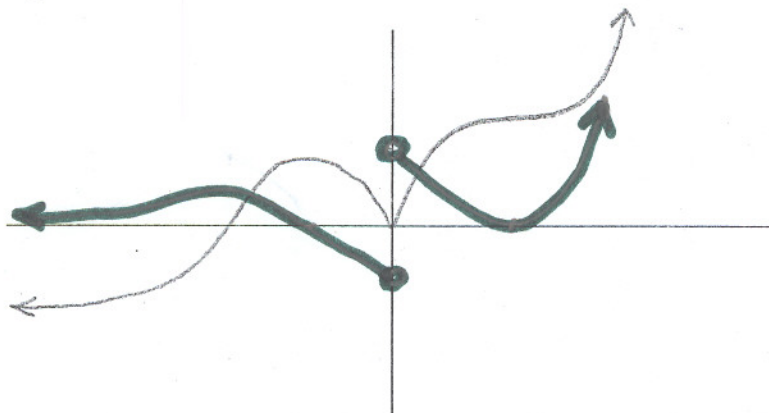
$$f(x) = x^2 - 5x + 8$$

SCORE: ____ / 10 POINTS

NO CALCULATORS ALLOWED

Sketch the derivative of the following function on the same set of axes.

SCORE: ____ / 4 POINTS



When a fixed quantity of a gas is compressed to a volume of x liters, the pressure exerted by the gas (in atmospheres) is given by $f(x)$. Interpret the following algebraic statements, making sure to specify the units of all numbers you mention.
NOTE: Do NOT use the phrases "rate of change", "tangent line", "secant line" or "derivative of".

SCORE: ____ / 2 POINTS

$$\lim_{h \rightarrow 0} \frac{f(7+h) - f(7)}{h} = -0.5$$

WHEN THE VOLUME OF THE GAS IS 7L, THE PRESSURE IT EXERTS DECREASES BY 0.5 ATMOSPHERES PER LITER AS IT EXPANDS (IE. ITS VOLUME INCREASES)

If $y = \frac{3x^2 - 4}{\sqrt[3]{x}}$, find $\frac{d^2y}{dx^2}$. Simplify your answer completely.

SCORE: ____ / 2 POINTS

$$y = 3x^{\frac{5}{3}} - 4x^{-\frac{1}{3}} \quad \frac{dy}{dx} = 5x^{\frac{2}{3}} + \frac{4}{3}x^{-\frac{4}{3}} \quad \frac{d^2y}{dx^2} = \frac{10}{3}x^{-\frac{1}{3}} - \frac{16}{9}x^{-\frac{7}{3}}$$

Find a quadratic function $f(x)$ such that $f(-1) = 2$, $f'(-1) = -3$ and $f''(-1) = 4$. Show your work.

SCORE: ____ / 3 POINTS

$$\begin{aligned} f(x) &= ax^2 + bx + c & f(-1) &= a - b + c = 2 \rightarrow 2 - 1 + c = 2 \rightarrow c = 1 \\ f'(x) &= 2ax + b & f'(-1) &= -2a + b = -3 \rightarrow -4 + b = -3 \rightarrow b = 1 \\ f''(x) &= 2a & f''(-1) &= 2a = 4 \rightarrow a = 2 \end{aligned}$$

$$f(x) = 2x^2 + x + 1$$