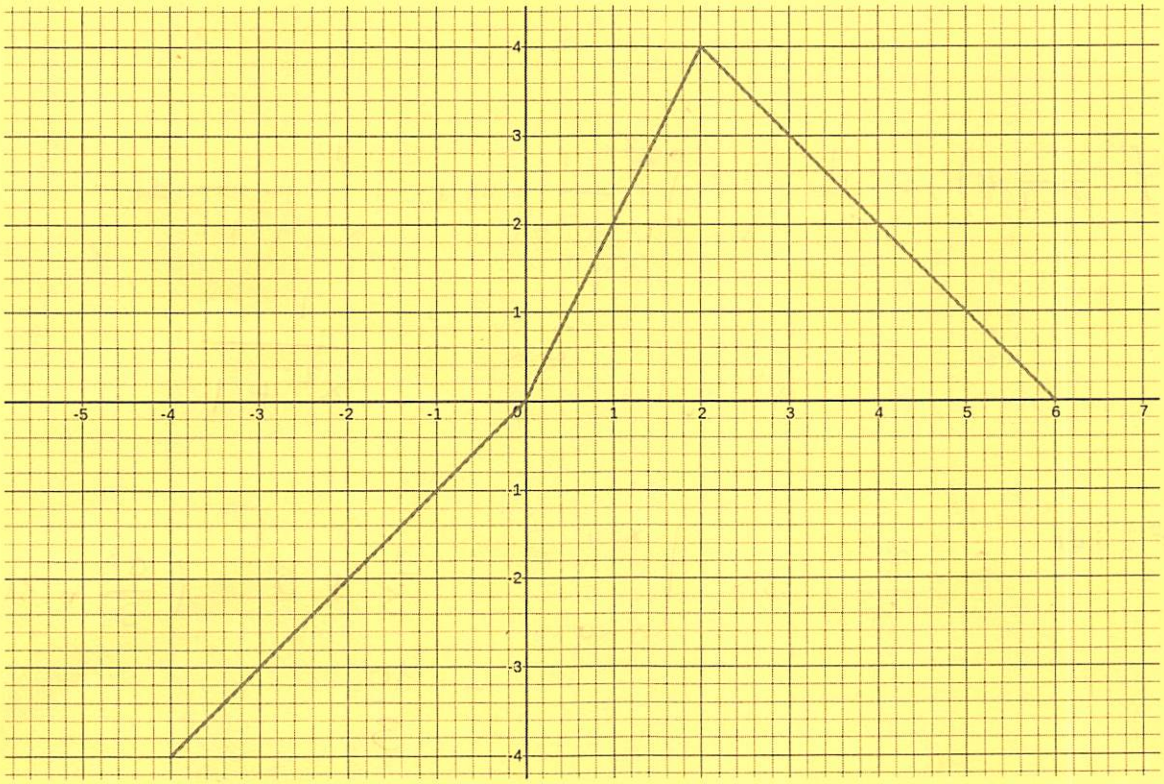
Worksheet 10 / 15 points

Name: Solutions Section: 5 6

Below is a graph of $f(x)$.



Define $g(x) = \int_{-1}^{x} f(t)\, dt$ and answer the following questions:

$g(1) = 1 - \frac{1}{2} = \frac{1}{2}$

$g(2) = 4 - \frac{1}{2} = \frac{7}{2}$

$g(3) = 7 + \frac{1}{2} - \frac{1}{2} = 7$

$g(-4) = \int_{-1}^{-4} f(t)\, dt = -\int_{-4}^{-1} f(t)\, dt = -\left(-\left(8 - \frac{1}{2}\right)\right) = 8 - \frac{1}{2} = \frac{15}{2}$

$g'(2) = f(2) = 4$

$g'(-1) = -1$

Give the intervals of increase and decrease for g: since $g'(x) = f(x)$,

g is increasing on $(0, 6)$
and decreasing on $(-4, 0)$

Compute the following:

$$\frac{d}{dx}\left(\int_1^x \frac{1}{t^2+1}\,dt\right) = \frac{1}{x^2+1}$$

$$\frac{d}{dx}\left(\int_x^{x^2} \frac{1}{t^2+1}\,dt\right) = \frac{d}{dx}\left(\int_1^{x^2}\frac{1}{t^2+1}\,dt + \int_x^1 \frac{1}{t^2+1}\,dt\right)$$

$$= \frac{1}{x^4+1}\cdot 2x - \frac{1}{x^2+1}$$

$$\int_0^1 x^2+3\,dx = \frac{x^3}{3}+3x\,\Big|_{x=0}^{x=1} = \frac{1}{3}+3-\left(\frac{0^3}{3}+3(0)\right)$$

$$= \frac{10}{3}$$

$$\int_1^4 \frac{1}{\sqrt{x}}+2x\,dx = 2\sqrt{x}+x^2\,\Big|_{x=1}^{x=4}$$

$$= 2\sqrt{4}+4^2-\left(2\sqrt{1}+1^2\right)$$

$$= 4+16-3 = 17$$

$\displaystyle\int_4^9 \frac{1+x^2}{\sqrt{x}}\,dx$ (you don't need to simplify)

$$= \int_4^9 \frac{1}{\sqrt{x}}+x^{3/2}\,dx = \left(2\sqrt{x}+\frac{x^{5/2}}{5/2}\right)\Bigg|_{x=4}^{x=9}$$

$$= 2\sqrt{9}+\frac{9^{5/2}}{5/2}-\left(2\sqrt{4}+\frac{4^{5/2}}{5/2}\right)$$

$$= 6+\frac{2\cdot 3^5}{5}-4+\frac{2\cdot 2^5}{5} = \text{a positive \# ..... or something}$$