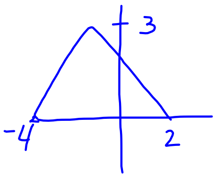
15



$$\frac{A}{\Delta x} = \frac{\frac{\cancel{6}\cdot 3}{2}}{\cancel{6}} = \frac{3}{2}$$

32. $y = \frac{1}{x}$ $[e, 2e]$

$$\frac{\int_e^{2e} \frac{1}{x}\,dx}{e} = \frac{\ln x \Big|_e^{2e}}{e}$$

$$\frac{\ln 2e - \cancel{\ln e}^{\,1}}{e}$$

$$\frac{\ln 2 + \cancel{\ln e} - \cancel{\ln e}}{e} = \frac{\ln 2}{e}$$

41

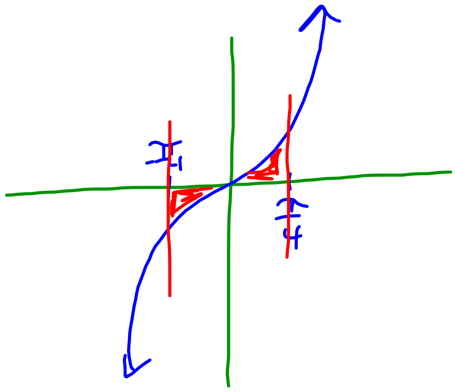
$1000\ m^3$ $1000\ m^3$

@ $10\ \frac{m^3}{min}$ @ $20\ \frac{m^3}{min}$

$$\frac{\text{total water}}{\text{total time}} = \frac{2000}{100 + 50} = \frac{\cancel{2000}^{40}\ m^3}{\cancel{150}_{3}\ min}$$

$$\frac{40}{3} = 13.\overline{3}\ \frac{m^3}{min.}$$

18.



13.

$y = -3x^2 - 1$ avg $= -2$

$-2 = -3x^2 - 1$

5.4b Fundamental Theorem of Calculus

$$F'(x) = f(x)$$

$$\int_a^b f(t)\,dt = F(b) - F(a)$$

$$\frac{d}{dx}\left(\int_a^x f(t)\,dt\right) = f(x)$$

$$\frac{d}{dx}\left(\int_{-\pi}^{x} \cos(t)\,dt\right) = \cos x$$

$$\frac{d}{dx}\left(\sin t \Big|_{-\pi}^{x}\right) = \frac{d}{dx}\left(\sin x - \sin(-\pi)\right)$$

$$\frac{d}{dx}\left(\int_0^x \left(\frac{1}{1+t^2}\right)dt\right) = \frac{1}{1+x^2}$$

$$\frac{d}{dx}\left(\int_5^x (3t^2 - 5t)\,dt\right)$$

$$3x^2 - 5x$$

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

$$\frac{d}{dx}\left(\sin t \Big|_1^{x^2}\right) = \frac{d}{dx}\left(\sin x^2 - \sin 1\right)$$

$$\frac{d}{dx}\left(\int_1^{5x} (t-1)\,dt\right) = 5(5x-1)$$

$$\frac{d}{dx}\left(\int_2^{x^2+1} \underbrace{\tan^{-1}(t)}\,dt\right) = 2x \tan^{-1}(x^2+1)$$

find $\frac{dy}{dx}$

$$y = \int_x^5 (3t\sin(t))\,dt = \frac{d}{dx}\left(-\int_5^x 3t \sin t \, dt\right)$$

$$\frac{dy}{dx} = -3x \sin x - \cancel{3(5)\sin 5 \cdot 0}$$

$$y = \int_{2x}^{x^2} \left(\frac{1}{2+e^t}\right)dt$$

$$\frac{dy}{dx} = \frac{1}{2+e^{x^2}} \cdot 2x - \frac{1}{2+e^{2x}} \cdot 2$$

$$\frac{2x}{2+e^{x^2}} - \frac{2}{2+e^{2x}}$$

Find a function $y = f(x)$ with derivative $\frac{dy}{dx} = 5x+2$

that satisfies the condition $f(2) = 10$

$$\int dy = \int (5x+2)\,dx$$

$$y = \frac{5x^2}{2} + 2x + C$$

$$\frac{5}{2}x^2$$

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

$$10 = \frac{5}{2}(2)^2 + 2(2) + C$$

$$-4 = C$$

Find a function $y = f(x)$ with derivative $\dfrac{dy}{dx} = \dfrac{1}{x}$

that satisfies the condition $f(3) = 5$

$A(x) = \ln x + C$

$5 = \ln 3 + C$

$C = 5 - \ln 3$

$y = \ln x + 5 - \ln 3$

$\dfrac{dy}{\cancel{dx}} = \dfrac{1}{x} \cdot dx$

$\int dy = \int \frac{1}{x}\, dx$

$y = \ln x + C$

$y = 5 + \boxed{\int_3^x \frac{1}{t}\, dt}$

$y = 5 + \ln t \Big|_3^x$

$y = 5 + \ln x - \ln 3$