

# WMATH1010 Problem Set 3

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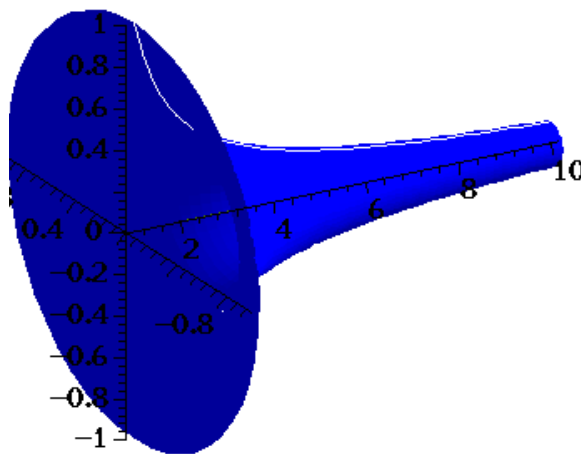
## Question 1

$$2\ln(x+2) + \frac{3}{2}\ln(x^2+6x+13) + \frac{1}{2}\arctan\left(\frac{x}{2} + \frac{3}{2}\right) + C$$

## Question 2

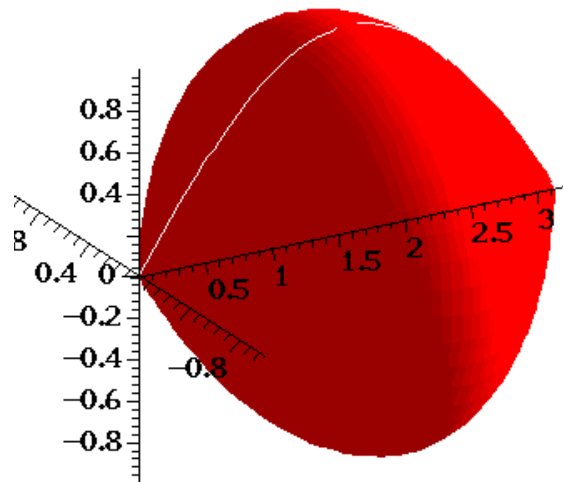
a)

$$V = \frac{9\pi}{10}u^3$$



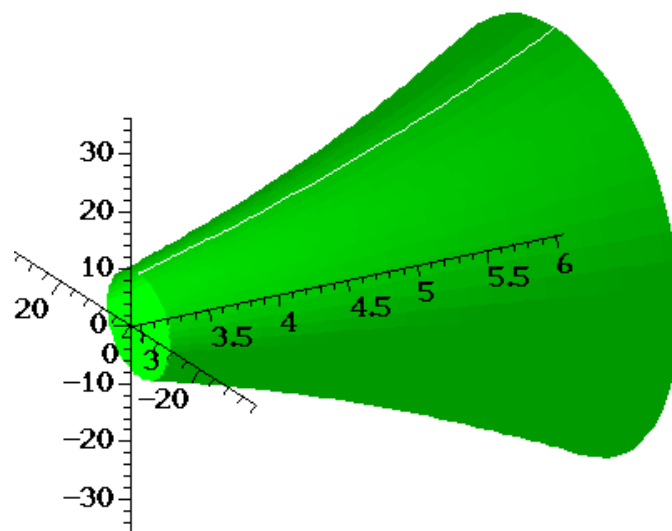
b)

$$V = \frac{\pi^2}{2} u^3$$



c)

$$V = \frac{7533\pi}{5} u^3$$



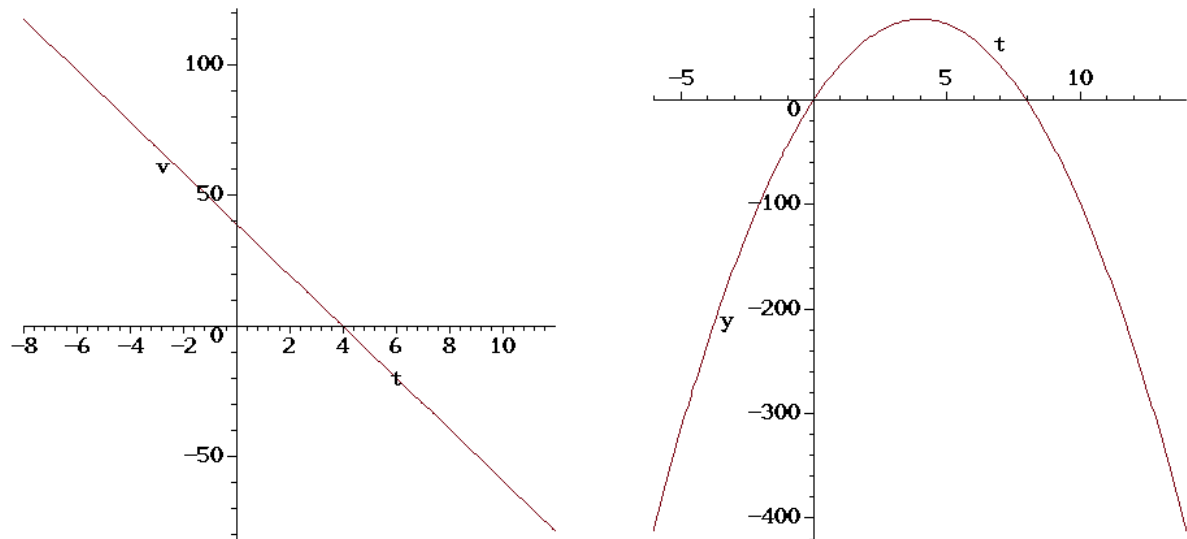
## Question 3

$$y_{\max} = 77.60m$$

$$t_{\text{total}} = 7.96s$$

$$v = 39 - 9.8t$$

$$y = 39t - 4.9t^2$$



## Question 4

A Bernoulli differential equation is of the form:

$$y' + p(x)y = q(x)y^n$$

Hence:

$$p(x) = x^5$$

$$q(x) = x^{12}$$

$$n = 0$$

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> ode:=diff(y(x),x) + x^5*y(x) = x^5*x^7;
ode := |--- y(x)| + x^5 y(x) = x^12
      \dx /
> dsolve(ode);
y(x) = ----- + x^7 - 7 x^6 - ----- + exp(- x^6/6) _C1
      14 exp(- x^6/6) x Pi      7 exp(- x^6/6) x GAMMA(1/6, - x^6/6)
      GAMMA(5/6) (-7776 x^6)      (-7776 x^6)
```

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