1. Integrate the following
   
   (a) \( \int \sin 3x \, dx \)

   (b) \( \int 5e^{-2x} \, dx \)

   (c) \( \int (x^2 - 3x + 1) \, dx \)

   (d) \( \int \frac{3}{1 + x^2} \, dx \)

   (e) \( \int \frac{6}{\sqrt{5 + x}} \, dx \)

   (f) \( \int \frac{4}{5 + x} \, dx \)

   (g) \( \int \frac{5}{x^2} \, dx \)

   (h) \( \int_0^2 (9 - x^3) \, dx \)
2. Determine $f'(x)$ if $f(x) = \int_3^{x^2} e^u \, du$

3. A boy lifts a kite off the ground with a vertical velocity, $v$, in ft/min with upward as positive indicated by the graph below:

(a) When does the kite start to fall? 

(b) What is $\int_0^3 v(t) \, dt$? 

(c) i. Does the kite fall back to the ground or does it land in a tree? 

ii. If in a tree, how high up?
4. Determine the antiderivative, $F(x)$, of $f(x)$ such that $F(0) = 3$ and
\[ f(x) = 2x + 3 - \sin \frac{1}{2}x \]

5. What is \( \int_{-1}^{1} f(x) \, dx \) where \( f(x) = \frac{x}{1 + x^2} \) as graphed below

6. A box with a square base and open top is to have volume 32 \( ft^3 \). Determine the dimensions of the box which uses minimum cardboard for material.

   (a) Draw and label picture.

   (b) \underline{\text{______________________________}} under the constraint that \underline{\text{______________________________}}

   (c) Set equation and solve: