Evaluate the following:

1. $\int 2x^3 - 3x\,dx$

2. $\int \dfrac{2}{3} e^x\,dx$

3. $\int \dfrac{\cos(x)}{2}\,dx$

4. $\int 3e^x + 4x^3\,dx$

5. $\int_{0}^{1} 3e^x + 4x^3\,dx$

Eugene, Rose and Corvy have discovered a secret portal to the planet *Velocipede* where the gravitational constant is slightly less than the gravitational constant of earth. On *Velocipede* the acceleration due to gravity is -4 meters / second^2 (on Earth it is -9.8 meters / second^2) Eugene, Rose and Corvy are very excited and spend a lot of time hurling objects directly upward on *Velocipede*, which conveniently has no air resistance.

6. Eugene, Rose and Corvy are on *Velocipede* and they hurl a ball directly upward from a height of eight meters. The ball hits the ground eight seconds later.
   a. What are the acceleration, velocity and height functions of the ball? Include units for each function. Show your work.
   b. What is the derivative / anti derivative relationship between the acceleration, velocity and height functions of the ball?
   c. Use calculus to determine the maximum height of the ball.
   d. How fast was the ball going when it hit the ground?
   e. How far, in total, did the ball travel during its flight? Use integral notation to show this.

7. Eugene, Rose and Corvy are on *Velocipede* and they use a bike-powered launcher to hurl a ball directly upward with an initial velocity of 140 meters / second. The ball reaches it maximum height of 2470 meters before gravity starts pulling it back to *Velocipede*.
   f. What is the ball's initial height? Show your work.
   g. What are the acceleration, velocity and height functions of the ball? Include units for each function.
   h. How fast was the ball going when it hit the ground?
   i. How far did the ball travel from $t = 30$ to $t = 60$ seconds? Use integral notation to show this.