Due by 9am on November 3. Please upload your solutions to Canvas as one PDF file. Do not forget to attach the honor code. Each problem is worth 10 points. You must show all your work for full credit.

(1) Find the velocity of an object dropped from a height of 300 m at the moment it hits the ground.

(2) A truck enters the off-ramp of a highway at $t = 0$. Its position after t seconds is $s(t) = 25t - 0.3t^3$ m for $0 \le t \le 5$.

  (a) How fast is the truck going at the moment it enters the off-ramp?

  (b) Is the truck speeding up or slowing down?

(3) For speeds s between 30 and 75 mph, the stopping distance of an automobile after the brakes are applied is approximately $F(s) = 1.1s + 0.05s^2$ ft. For $s = 60$ mph:

  (a) Estimate the change in stopping distance if the speed is increased by 1 mph.

  (b) Compare your estimate with the actual increase in stopping distance.

(4) The height (in meters) of a helicopter at time t (in minutes) is $s(t) = 600t - 3t^3$ for $0 \le t \le 12$.

  (a) Plot $s(t)$ and velocity $v(t)$.

  (b) Find the velocity at $t = 8$ and $t = 10$.

  (c) Find the maximum height of the helicopter.

(5) The height at time t (in seconds) of a mass, oscillating at the end of a spring, is $s(t) = 300 + 40 \sin t$ cm. Find the velocity and acceleration at $t = \frac{\pi}{3}$ s.

(6) Calculate the first five derivatives of $f(x) = \cos x$. Then determine $f^{(8)}$ and $f^{(37)}$.

(7) Find the values of x between 0 and 2π where the tangent line to the graph of $y = \sin x \cos x$ is horizontal.

(8) Compute the derivative.

  (a) $y = (x^4 - x^3 - 1)^{2/3}$

  (b) $y = \left(\dfrac{x+1}{x-1}\right)^4$

  (c) $y = (9 - (5 - 2x^4)^7)^3$

  (d) $y = (x^3 + 3x + 9)^{-4/3}$

(9) Compute the derivative.

  (a) $y = \sin(\sqrt{x^2 + 2x + 9})$

  (b) $y = \tan(4 - 3x)\,\sec(3 - 4x)$

  (c) $y = \sqrt{\sin x\, \cos x}$

  (d) $y = \sin(x^2)\,\cos(x^2)$

(10) Compute the derivative.

  (a) $y = \sqrt{\sqrt{x+1} + 1}$

  (b) $y = \sqrt{1 + \sqrt{1 + \sqrt{x}}}$

  (c) $y = \left(x + \dfrac{1}{x}\right)^{-1/2}$

  (d) $y = \dfrac{\cos(1/x)}{1 + x^2}$