1. [12 points] Indicate if each of the following is true or false by circling the correct answer (Justify your answer):

a. [3 points] If $F(t)$ and $G(t)$ are antiderivatives of the function $f(t)$ with $F(0) = 1$ and $G(0) = 3$ then $F(2) - G(2) = 1$.

True **[False]**

Solution: $F(2) - G(2) = F(0) - G(0) = 1 - 3 = -2$

b. [3 points] If $h(t) > 0$ for $0 \le t \le 1$, then the function $H(x) = \int_0^x h(t)dt$ is concave up for $0 \le x \le 1$.

True **[False]**

Solution: $H'(x) = h(x) > 0$, hence $H(x)$ is increasing in $0 \le x \le 1$, but not necessarily concave up. You need $H''(x) = h'(x) > 0$ for $H(x)$ to be concave up.

c. [3 points] If $\int_0^2 g(t)dt = 6$ then $\int_2^3 3g(2t-4)dt = 9$.

[True] False

Solution: Using $u = 2t - 4$ then $\int_2^3 3g(2t-4)dt = \frac{3}{2}\int_0^2 g(u)du = 9$

d. [3 points] $\frac{d}{dx}\left(\int_{-x^2}^{\sin x} e^{t^3}dt\right) = \cos x\ e^{x^3} + 2xe^{x^3}$.

True **[False]**

Solution: $\frac{d}{dx}\left(\int_{-x^2}^{\sin x} e^{t^3}dt\right) = \cos x\ e^{\sin^3 x} + 2xe^{-x^6}$.