Name: ————————————————————————   ——————— / 24

24 points possible; each part is worth 2 points. No aids (book, notes, calculator, phone, etc.) are permitted. Show all work and use proper notation for full credit. Answers should be in reasonably-simplified form.

1. **[12 points]** Compute the derivatives of the following functions.

a. $f(x) = \dfrac{\sqrt{x}}{3} + \dfrac{5}{\sqrt{x}} - \dfrac{\sqrt{\pi}}{3}$

b. $f(x) = (\cos(4x) + e^x)^3$

c. $h(x) = \ln(a + x^b)$ where a and b are constants

d. $f(x) = \sec(x)\tan(x)$

e. $h(\theta) = \dfrac{\sin(\theta)}{e^{2\theta}}$

f. Find $\dfrac{dy}{dx}$ if $e^y + x^3 = 10 + xy$. You must solve for $\dfrac{dy}{dx}$.

2. **[12 points]** Compute the following antiderivatives (indefinite integrals) and definite integrals. Remember that antiderivatives need a "$+C$".

   a. $\displaystyle\int_0^1 4e^x + \cos(x)\, dx$

   b. $\displaystyle\int x + x\sin(x^2 + 1)\, dx$

   c. $\displaystyle\int \frac{7 - x + x^4}{x^2}\, dx$

d. $\displaystyle\int \frac{1+\sec^2(t)}{t+\tan(t)}\,dt$

e. $\displaystyle\int \frac{\cos(\arctan(x))}{1+x^2}\,dx$

f. $\displaystyle\int x(x+1)^5\,dx$