Each problem is worth 5 points. Clear and complete justification is required for full credit.

1. Find the most general antiderivative of the function $f(x) = 6\sqrt{x} - \sqrt[6]{x}$.

$$f(x) = 6x^{1/2} - x^{1/6}$$
$$F(x) = 6\left(\tfrac{2}{3}\right)x^{3/2} - 6/7 x^{7/6} + C$$
$$F(x) = 4x^{3/2} - 6/7 x^{7/6} + C \qquad \text{Good}$$

2. Find f if $f''(x) = 2 - 12x$, $f(0) = 9$, and $f(2) = 15$.

$$f''(x) = 2 - 12x \qquad \text{First find the antiderivatives.}$$
$$(1)\; f'(x) = 2x - 6x^2 + C$$
$$(2)\; f(x) = x^2 - 2x^3 + Cx + D$$

Then plug in to solve for **D**:

$$f(0) = 0^2 + 2(0)^3 + C(0) + D = 9$$
$$9 = D$$

Plug in D, and solve for C:

$$f(2) = 15 = (2)^2 - 2(2)^3 + C(2) + 9$$
$$= 4 - 16 + 2C + 9$$
$$18 = 2C$$
$$C = 9$$

Great!

$$\boxed{f(x) = x^2 - 2x^3 + 9x + 9}$$