Compute each of the following antiderivatives

1. $\int x^2 dx$
2. $\int \left(x^5 - 2x^4 + 3\right)\ dx$
3. $\int \sqrt{y}\ dy$
4. $\int ab^2x^3\ dx$
5. $\int ab^2x^3\ da$
6. $\int ab^2x^3\ db$
7. $\int 1\ dx$
8. $\int \sin\theta\ d\theta$
9. $\int \cos\alpha\ d\alpha$
10. $\int -10\ dt$
11. $\int (-10t + v_0)\ dt$
12. $\int \left(\frac{1}{m^2} - \sqrt{m}\right)\ dm$
13. $\int \left(-\frac{3}{\sqrt{y}} - \sqrt{y} + 2xy\right)\ dx$
14. $\int \left(-\frac{3}{\sqrt{y}} - \sqrt{y} + 2xy\right)\ dy$
15. $\int \left(\sin^2\theta + \cos^2\theta\right)\ d\theta$

16. Find a function f with the following properties: $f'(x) = x^2 - 6x + 1$ and $f(0) = -2$.
17. Find a function f with the following properties: $f'(x) = 6x^2 + 10x - 2$ and $f(2) = 27$.
18. Find a function f with the following properties: $f'(x) = \frac{1}{x^3}$ and $f(-1) = 3$.
19. Find a function f with the following properties: $f'(x) = \sin x$ and $f(\pi) = -2$.
20. The following problem is an application to physics, where things are very often functions of time, denoted by t. So use t instead of x.
    a) We know the following about f'': it is a constant, with value a. Find f' if we also know that $f'(0) = v_0$
    b) Find f if we also know that $f(0) = s_0$

Answers

1. $\frac{x^3}{3}+C$ 2. $\frac{1}{6}x^6-\frac{2}{5}x^5+3x+C$ 3. $\frac{2}{3}y^{3/2}+C$ 4. $\frac{1}{4}ab^2x^4+C$ 5. $\frac{1}{2}a^2b^2x^3+C$

6. $\frac{1}{3}ab^3x^3+C$ 7. $x+C$ 8. $-\cos\theta+C$ 9. $\sin\alpha+C$ 10. $-10t+C$ 11. $-5t^2+tv_0+C$

12. $-\frac{1}{m}-\frac{2}{3}m\sqrt{m}+C$ 13. $-\frac{3}{\sqrt{y}}x-\sqrt{y}x+x^2y+C$ 14. $-6\sqrt{y}-\frac{2}{3}y\sqrt{y}+xy^2+C$ 15. $\theta+C$

16. $f(x)=\frac{1}{3}x^3-3x^2+x-2$ 17. $f(x)=5x^2-2x+2x^3-5$ 18. $f(x)=-\frac{1}{2x^2}+\frac{7}{2}$

19. $f(x)=-\cos x-3$ 20. a) $f'(t)=at+v_0$ b) $f(t)=\frac{a}{2}t^2+v_0t+s_0$

