

1. (a) $\langle -\frac{3}{5}, \frac{4}{5} \rangle$
(b) $\cos \theta = -\frac{8}{\sqrt{5}\sqrt{13}}$
(c) $\text{comp}_{\vec{b}}\vec{a} = -\frac{8}{\sqrt{13}}, \text{proj}_{\vec{b}}\vec{a} = \langle \frac{16}{13}, -\frac{24}{13} \rangle$
2. $W = 80 \cos(40^\circ)$
3. $\frac{13}{5}$
4. Vector equation: $\vec{r}(t) = \langle 1+t, -3+4t \rangle$ or $\vec{r}(t) = \langle 2+t, 1+4t \rangle$. Parametric equations:
 $x(t) = 1+t, y(t) = -3+4t$ or $x(t) = 2+t, y(t) = 1+4t$
5. Jump discontinuity at $x = 2$
6. Vertical asymptotes: $x = 1, x = -1$. Horizontal asymptote $y = \frac{1}{3}$
7. (a) $\frac{dy}{dx} = (\sin x)^x (\ln(\sin x) + x \cot x)$
(b) $\frac{dy}{dx} = \frac{\sqrt[5]{2x-1}(x^2-4)^2}{\sqrt[3]{1+3x}} \left(\frac{2}{5(2x-1)} + \frac{2}{x-2} + \frac{2}{x+2} - \frac{1}{1+3x} \right)$
(c) $\frac{dy}{dx} = -\frac{\sqrt{1-t^4}}{2t\sqrt{1-t^2}}$
(d) $\frac{dy}{dx} = \frac{1-4x-2y}{2x+2y}$
8. $y = \frac{7}{4}(x-1) + 2$
9. (a) $v(t) = 3t^2 - 12, a(t) = 6t$
(b) $t > 2$
(c) 23
10. $\vec{v}(1) = \langle 1, 15 \rangle, s(1) = \sqrt{226}, \vec{a}(1) = \langle 0, -10 \rangle$
11. $y'' = 16e^{-5x} \cos 3x + 30e^{-5x} \sin 3x$
12. $\frac{d^{50}}{dx^{50}} \cos 2x = -(2^{50}) \cos 2x$
13. 1.9
14. $\frac{4}{3} \text{cm}^2$
15. $g'(1) = \frac{1}{2}$

16. 4

17. $\frac{3\pi}{4}$

18. (a) 1

(b) 0

(c) 1

19. The absolute maximum value is $\frac{4}{27}$. The absolute minimum value is -4.

20. (a) f is increasing on $(-\sqrt{3}, 0) \cup (\sqrt{3}, \infty)$. f is decreasing on $(-\infty, -\sqrt{3}) \cup (0, \sqrt{3})$

(b) f has a local max at $x = 0$. f has the local min at $x = \pm\sqrt{3}$.

(c) f is CU on $(-\infty, -1) \cup (1, \infty)$. f is CD on $(-1, 1)$

(d) f has inflection points at $x = \pm 1$.

21. (24cm) \times (36cm)

22. $2^n - 1 + \frac{n(n+1)(2n+1)}{6}$

23. $f'(x) = \frac{x}{2\sqrt{x}(x+1)}$

24. (a) $\frac{29}{6}$

(b) $\frac{2}{5}(2^{5/2} - 1) + 2(2^{1/2} - 1)$

(c) 3

(d) $-\frac{3}{4}(1-x)^{4/3} + C$

(e) $\frac{(1+\sqrt{x})^{10}}{5} + C$

(f) $x - e^{-x} + C$

(g) $\frac{10}{3}$

(h) $-\frac{\pi^2}{9}$

25. $\frac{16}{3}$

26. $s(t) = \frac{t^4}{12} - \frac{t^3}{6} + 2t + 1$

27. $\vec{r}(t) = \langle \frac{t^3}{3} + t + 1, \frac{t^2}{2} + t \rangle$