1.

$$f(x) = x^3 - 4x^2 + 5\pi$$
$$\text{Then,} \quad f'(x) = 3x^2 - 8x.$$
$$\text{So,} \quad f'(-2) = 12 + 16 = 28.$$

2.

$$f(x) = \sqrt{x} = x^{1/2}$$
$$\text{Then,} \quad f'(x) = \frac{1}{2}\,x^{-1/2} = \frac{1}{2\sqrt{x}}.$$
$$\text{So,} \quad f'(4) = \frac{1}{2\sqrt{4}} = \frac{1}{4}.$$

3.

$$f(x) = \frac{1}{\sqrt[3]{x}} = x^{-1/3}$$
$$\text{Then,} \quad f'(x) = -\frac{1}{3}\,x^{-4/3} = -\frac{1}{3\,x^{4/3}} = -\frac{1}{3\sqrt[3]{x^4}}.$$
$$\text{So,} \quad f'(1) = -\frac{1}{3\sqrt[3]{1^4}} = -\frac{1}{3}.$$

4.

$$f(x) = x^4 + 2\,e^x$$
$$\text{Then,} \quad f'(x) = 4x^3 + 2\,e^x.$$
$$\text{So,} \quad f'(0) = 0 + 2\,e^0 = 0 + 2 = 2.$$

5.

$$f(x) = x - \sqrt{x} = x - x^{1/2}$$
$$\text{Then,} \quad f'(x) = 1 - \frac{1}{2}\,x^{-1/2} = 1 - \frac{1}{2\sqrt{x}}.$$
$$\text{So,} \quad f'(1) = 1 - \frac{1}{2\sqrt{1}} = 1 - \frac{1}{2} = \frac{1}{2}.$$

6.

$$f(s) = \sqrt{s}(s-1) = s^{1/2}(s^1 - 1) = s^{3/2} - s^{1/2}$$
$$\text{Then,} \quad f'(s) = \frac{3}{2}\,s^{1/2} - \frac{1}{2}\,s^{-1/2} = \frac{3}{2}\,\sqrt{s} - \frac{1}{2\sqrt{s}}.$$

7.

$$f(t) = \frac{t^2 - 3t + 1}{\sqrt{t}} = \frac{t^2}{t^{1/2}} - 3\frac{t}{\sqrt{t}} + \frac{1}{\sqrt{t}}$$
$$= t^{3/2} - 3t^{1/2} + t^{-1/2}$$
$$f'(t) = \frac{3}{2}t^{1/2} - \frac{3}{2}t^{-1/2} - \frac{1}{2}t^{-3/2}.$$
$$= \frac{3}{2}\sqrt{t} - \frac{3}{2\sqrt{t}} - \frac{1}{2\,t^{3/2}}.$$

8.

Here $y = x^4 - 3x^2 + 5$, so $y' = 4x^3 - 6x$. Then plug in $x = 1$ in the y', we get the slope, $m = 4 - 6 = -2$. A point on the tangent is $(x, y) = (1, 1 - 3 + 5) = (1, 3)$. Now using formula $y = mx + b$, we get $3 = -2 \cdot 1 + b$. So $b = 5$. Then an equation of the tangent line is $y = -2x + 5$.

9.

$$s = t^4 - 2t^3 + t^2 - t$$
$$\text{Then velocity} \quad s' = 4t^3 - 6t^2 + 2t - 1.$$
$$\text{So velocity after 1 sec} \quad s'(1) = 4 - 6 + 2 - 1 = -1.$$

10.

$$s = t^4 - 2t^3 + t^2 - t$$
$$\text{Then velocity, } s' = 4t^3 - 6t^2 + 2t - 1$$
$$\text{And acceleration, } s'' = 12t^2 - 12t + 2$$
$$\text{So acceleration after 1 sec,} \quad s''(1) = 12 - 12 + 2 = 2.$$

11.

$$f(x) = e^x$$
$$\text{Then, } f'(x) = e^x, \quad \text{and} \quad f'(2) = e^2.$$
$$\text{So,} \quad \ln(f'(2)) = \ln(e^2) = 2.$$

report any mistakes to rdahal@coastal.edu