

MATH 149 HOMEWORK 7 SOLUTIONS

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2.2 #40.

$$f(x) = x^2 - 3x - 3x^{-2}$$

$$f'(x) = 2x - 3 + 6x^{-3} = \boxed{2x - 3 + \frac{6}{x^3}}$$

#32. $f(t) = 3 - \frac{3}{5t}$
rewrite $f(t) = 3 - \frac{3}{5}t^{-1}$

#42.

$$f(x) = x + \frac{1}{x^2} \xrightarrow{\text{rewrite}} x + x^{-2}$$

$$f'(x) = 1 - 2x^{-3} = \boxed{1 - \frac{2}{x^3}}$$

$$f'(t) = 0 + \frac{3}{5}t^{-2} = \frac{3}{5t^2}$$

$$\text{slope} = f'\left(\frac{3}{5}\right) = \frac{3}{5\left(\frac{3}{5}\right)^2} = \frac{5}{3}$$

$$\text{tangent line: } \boxed{y - 2 = \frac{5}{3}\left(x - \frac{3}{5}\right)}$$

#44.

$$h(x) = \frac{2x^2 - 3x + 1}{x} \xrightarrow{\text{rewrite}} 2x - 3 + \frac{1}{x}$$

$$= 2x - 3 + x^{-1} = \boxed{2x - 3 + x^{-1}}$$

$$h'(x) = 2 - x^{-2} = 2 - \frac{1}{x^2}$$

$$\boxed{y = \frac{5}{3}x + 1}$$

#48.

$$f(x) = \sqrt[3]{x} + \sqrt[5]{x} \xrightarrow{\text{rewrite}} x^{1/3} + x^{1/5}$$

$$\boxed{f'(x) = \frac{1}{3}x^{-2/3} + \frac{1}{5}x^{-4/5}}$$

#50.

$$f(t) = t^{2/3} - t^{1/3} + 4$$

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

$$= \boxed{\frac{2}{3\sqrt[3]{t}} - \frac{1}{3\sqrt[3]{t^2}}}$$

2.3 #6.

$$g(x) = \sqrt{x} \sin x$$

(product rule) $g'(x) = \frac{1}{2\sqrt{x}} \sin x + \sqrt{x} \cos x = \frac{\sin x}{2\sqrt{x}} + \sqrt{x} \cos x$

#8.

$$g(t) = \frac{t^2 + 2}{2t - 7} \Rightarrow g'(t) = \frac{2t(2t - 7) - (t^2 + 2) \cdot 2}{(2t - 7)^2} \quad (\text{quotient rule})$$

$$= \boxed{\frac{2t^2 - 14t - 4}{(2t - 7)^2}}$$

#14.

$$f(x) = (x^2 - 2x + 1)(x^3 - 1)$$

$$f'(x) = (2x - 2)(x^3 - 1) + (x^2 - 2x + 1) \cdot 3x^2 \quad (\text{product rule})$$

$$f'(1) = (2 - 2)(1^3 - 1) + (1^2 - 2 + 1) \cdot 3 = \underline{\underline{0}}$$

#16.

$$f(x) = \frac{x+1}{x-1}$$

(quotient rule) $f'(x) = \frac{1 \cdot (x-1) - (x+1) \cdot 1}{(x-1)^2} = \frac{x-1-x-1}{(x-1)^2} = \frac{-2}{(x-1)^2}$

$$f'(2) = \frac{-2}{(2-1)^2} = \frac{-2}{1} = \underline{\underline{-2}}$$