1. $\lim_{x \to 1} \dfrac{x^4 - 1}{x^2 + x - 2} =$

(a) $\dfrac{4}{3}$ ——————————————————(correct)

(b) does not exist

(c) $\dfrac{2}{3}$

(d) 0

(e) $\dfrac{8}{3}$

$$\lim_{x \to 1} \frac{(x^2-1)(x^2+1)}{(x+2)(x-1)} = \lim_{x \to 1} \frac{\cancel{(x-1)}(x+1)(x^2+1)}{(x+2)\cancel{(x-1)}}$$

$$= \frac{(2)(2)}{3} = \frac{4}{3}.$$

Similar to Q30, 10.1

2. $\lim_{x \to 7} \dfrac{\sqrt{x-3} - 2}{x - 7} =$

$$\lim_{x \to 7} \frac{\sqrt{x-3} - 2}{x-7} \cdot \frac{\sqrt{x-3} + 2}{\sqrt{x-3} + 2}$$

(a) $\dfrac{1}{4}$ ——————————————————(correct)

(b) 1

(c) 4

(d) 0

(e) does not exist

$$= \lim_{x \to 7} \frac{\cancel{(x-7)}}{\cancel{(x-7)}(\sqrt{x-3}+2)} = \frac{1}{2+2} = \frac{1}{4}$$

Similar to Q43, 10.1

3. $\lim_{x\to\infty} \dfrac{3-4x-2x^3}{5x^3-8x+1} =$ $\lim_{x\to\infty} \dfrac{-2x^3}{5x^3} = -\dfrac{2}{5}$

(a) $-\dfrac{2}{5}$ ____ (correct)

(b) $-\infty$

(c) $-\dfrac{1}{2}$

(d) $-\dfrac{4}{5}$

(e) $\dfrac{3}{5}$

Q29, 10.2

4. $\lim_{x\to -2^-} \dfrac{-3}{x+2} =$ $\dfrac{-3}{0^-} \longrightarrow \infty$

(a) ∞ ____ (correct)

(b) $-\infty$

(c) 0

(d) -4

(e) -3

Q13, 10.2

5. $\lim_{t \to 0} \dfrac{t}{t^3 - 4t + 3} = \dfrac{0}{0-0+3} = 0$

(a) 0 ____________________ (correct)

(b) ∞

(c) 3

(d) $\dfrac{1}{3}$

(e) $-\dfrac{1}{4}$

Q17, 10.1

6. The number of discontinuity points of the function $f(x) = \dfrac{x-3}{x^3 - 9x}$ is

(a) 3 ____________________ (correct)

(b) 0

(c) 1

(d) 2

(e) 4

$x^3 - 9x = 0$

$x(x^2 - 9) = 0$

$x(x-3)(x+3) = 0$

$x = 0, \quad x = 3, \quad x = -3$

Q25, 10.3

7. The graph of the function $f(x) = 3x^2 - x^3$ has horizontal tangent lines at

(a) $x = 0$ and $x = 2$ ______ (correct)
(b) $x = 0$, $x = -1$ and $x = 2$
(c) $x = 1$ and $x = 2$
(d) $x = 0$ and $x = -2$
(e) $x = 0$ and $x = 1$

Similar to Q85, 11.2

$f'(x) = 6x - 3x^2$

$f'(x) = 0 \Rightarrow 6x - 3x^2 = 0$

$3x(2-x) = 0$

$x = 0, \ x = 2$

8. If the manufacturer's average-cost equation is given by $\bar{c} = 0.00002q^2 - 0.01q + 6 + \frac{20000}{q}$. Then the marginal cost when $q = 100$, is

(a) 4.6 ______ (correct)
(b) 6.6
(c) 3.6
(d) 4.4
(e) 8.6

$c = q\bar{c} = 0.00002q^3 - 0.01q^2 + 6q + 20000$

$\frac{dc}{dq} = 0.00006q^2 - 0.02q + 6$

$\left.\frac{dc}{dq}\right|_{q=100} = 0.00006(100)^2 - 0.02(100) + 6$

$= 4.6$

Q21, 11.3

9. The equation of the tangent line of the graph of the function, $f(x) = 3x - 4\sqrt{x}$ at $x = 4$, is

(a) $y = 2x - 4$ ______ (correct)

(b) $y = 2x + 4$

(c) $y = -2x - 4$

(d) $y = -x + 8$

(e) $y = x$

Q78, 11.2

• $f(4) = 4 \Rightarrow$ pt. $(4, 4)$.

$f'(x) = 3 - \frac{4}{2\sqrt{x}} = 3 - \frac{2}{\sqrt{x}}$

slope $= f'(4) = 3 - \frac{2}{\sqrt{4}} = 2$

the equation of the tangent line at $(4,4)$ is

$y - 4 = 2(x-4)$

$\Rightarrow y = 2x - 4$.

10. If the demand equation for manufacturer's product is given by $p = \frac{1000}{q+5}$. Then the marginal revenue when $q = 45$, is

(a) 2 ______ (correct)

(b) 3

(c) $\frac{1}{2}$

(d) 4

(e) 5

$r = pq = \frac{1000q}{q+5}$

$\frac{dr}{dq} = \frac{(q+5)(1000) - 1000q(1)}{(q+5)^2} = \frac{5000}{(q+5)^2}$

Ex. 8, 11.4

$\left.\frac{dr}{dq}\right|_{q=45} = \frac{5000}{2500} = 2$.

11. The slope of the curve $y = (x^2 - 3x + 1)^3$ at $x = 1$, is

(a) -3 ________________ (correct)

(b) 3

(c) 6

(d) -6

(e) -2

$$\frac{dy}{dx} = 3(x^2 - 3x + 1)^2 (2x - 3)$$

$$\left.\frac{dy}{dx}\right|_{x=1} = 3(1-3+1)^2(2-3)$$

$$= -3$$

Similar to Q57, 11.5

12. If $f(x) = e + x^e - 2e^{\sqrt{x}} + \ln x$, then $f'(1) =$

(a) 1 ________________ (correct)

(b) $2e$

(c) $3e$

(d) $1 - e$

(e) $1 + e$

$$f'(x) = 0 + e\,x^{e-1} - 2\left(\frac{1}{2\sqrt{x}}\right)e^{\sqrt{x}} + \frac{1}{x}$$

$$f'(1) = e - e + 1$$

$$= 1$$

Similar to Q5, 12.2

13. The slope of the tangent line of the curve $x^2 + y^2 = 25$ at the point $(3, 4)$ is

(a) $-\frac{3}{4}$ ____ (correct)

(b) $\frac{3}{4}$

(c) $\frac{4}{3}$

(d) 1

(e) -1

$$2x + 2y\,y' = 0$$

$$y' = -\frac{x}{y}$$

$$y'\Big|_{(3,4)} = -\frac{3}{4}$$

Similar to Q1, 12.4

14. A consumption function is given by $C = 6 + \frac{3}{4}I - \frac{\sqrt{I}}{3}$. The marginal propensity to save when $I = 25$ is

(a) $\frac{17}{60}$ ____ (correct)

(b) $\frac{43}{60}$

(c) $\frac{47}{60}$

(d) $\frac{27}{60}$

(e) $\frac{33}{60}$

$$\frac{dc}{dI} = \frac{3}{4} - \frac{1}{3}\left(\frac{1}{2\sqrt{I}}\right)$$

$$\frac{dc}{dI}\Big|_{I=25} = \frac{3}{4} - \frac{1}{3}\left(\frac{1}{10}\right) = \frac{43}{60}$$

marginal propersity to save $= 1 - \frac{43}{60}$

$$= \frac{17}{60}.$$

Q66, 11.4

15. If the position function of an object moving along a straight line is given by $s = f(t) = -3t^2 + 2t + 1$, where t is in seconds and s is in meters, then the **average velocity** over the interval $[1, 2]$ is

(a) -7 ____________________ (correct)

(b) -10

(c) -4

(d) -8

(e) -6

$$\text{Av. velocity} = \frac{f(2) - f(1)}{2-1} = \frac{-7-0}{1} = -7$$

Similar to Q3, 11.3